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Electricity Supply Economics

Tariff-framing Considerations

HAS any commodity that is sold on so large a scale and fulfils so undisputed a public service as electricity ever been marketed on so irrational a commercial basis? Immense as has been the growth of consumption during the past twenty years, it is safe to say that the total kWh generated would now be much higher had something better than rule-of-thumb principles been applied to the framing of tariffs in the past.

In more recent years, as a result of hard-won experience which has been placed freely at the disposal of others at institution meetings and in the Press, supply engineers have gradually evolved an empirical framework which has enabled them generally to find out how they stand in the matter of securing loads of a more or less standard type. Why, then, trouble about so academic an aspect as that which might be described as a philosophy of tariff making? The answer is that lack of appreciation of underlying economic principles has had, and may still have, as seriously adverse consequences in the development of loads possessing a high degree of elasticity, *i.e.*, a sensitive response to price changes, as would ignorance of electrical principles in the running of a power station.

" Psycho-analysis "

In this issue Mr. D. J. Bolton presents what might be termed an introduction to such a philosophy. He himself describes it as "an attempt at psycho-analysis," and there is a good deal in this. Many supply engineers, knowing, as a matter of common sense, the results they ought to get, yet not quite satisfied as to the ethical justification of the only way of getting them, have been subject to the repressions and inhibtions that are said to follow refusal to face the facts of life. Few men without an engineering background have proved successful in coping with the technicalities involved in organising the sale of electricity on a large scale. On the other hand, supply engineers have not always made the most of their tactical advantage. They have even been taunted with holding the view that there is something derogatory in selling their own product.

Such a criticism is, we believe, unjust. The trouble is that the engineer, brought up to regard costs of production as the criterion of excellence, does not naturally take account of the fact that economics is the practical science of production *and distribution*. That is to say, it is not a question of supply alone, but of supply and demand. The engineer, in trying to compel acceptance of his own valuation of his product, which is naturally based on costs, has quite unwarrantably ignored its worth to consumers. As a result, he tends to feel uneasy about the price differentiation that he must make between various classes of consumers in order to give weight to their preferences. Unmindful of the distinction between making surpluses and distributing them, he is apt to regard the higher surplus made in some cases as akin to profiteering, which, of course, does not come into the question unless the profit for the undertaking as a whole is unduly high.

Influence of Diversity Factor

In the old days when power and lighting were the only important loads, it was not difficult to justify varying charges on the ground of load factor, but many demands with a greater degree of elasticity have come along since then. These have made it necessary to face the issue that though the costs of supplying them may be as great as for other classes of consumers, the business cannot be secured at the same price. Fortunately, diversity factor, which has almost superseded load factor as the deciding influence and is less easily estimated, could often be invoked to provide the excuse thought necessary to account for lower charges, and so things have gone ahead, notwithstanding.

Uncertainty of outlook has probably been partly responsible for lack of uniformity in methods of charging, which was one of the major causes of public dissatisfaction that led to the setting up of the Weir Committee. This Committee emphasised the need for improvement in this way and, further, made clear the real purpose of tariffs from the demand aspect, as distinct from their function on the supply side of bringing in sufficient total revenue to cover costs. That purpose is to encourage increased consumption.

Growth of faith in the " promotional " mission of tariffs is well illustrated in the review of electricity supply tariffs and charges during the past eight years, which has been contributed by Mr. J. A. Sumner to the I.E.E. *Journal* recently. The success of two-part tariffs (whether open or disguised) has done

much to destroy the exclusively supply attitude to price, since they are based on factors, *e.g.*, floor area or rateable value, that bear little obvious relation to cost items. The average price of domestic electricity has come down rapidly since their more general adoption, but this has been more due to the effect of greater consumption than to actual lowering of charges. These would have been lower still had the principles enunciated by Mr. Bolton been adequately recognised in earlier years.

Institution Meetings

As was generally anticipated, no meetings of the Institution of Electrical Engineers are to be held during the first half of this session. Copies of the papers planned for will, however, be circulated to members interested at about the date on which they were to have been read. These will include the presidential address of Mr. Johnstone Wright, which would have been delivered on October 26th. Members will receive further information from the Institution in a few days' time. Somewhat similar arrangements, it is hoped, will be made for the Technical Groups of the Electrical Power Engineers' Association. This determination to keep going is as inspiring as it is welcome as a sign of vitality. Those who prepare technical papers naturally tend to be men whose time is most fully occupied in ordinary times and will be even more so in present conditions. The additional effort by these men in getting together information for the benefit of their fellow electrical engineers is a great national service at a critical time. It also provides an illustration of the saying that one goes to a busy man to get anything done.

Technical Literature

WHILE our fight for national existence will undoubtedly stimulate electrical progress, there is a danger that much of the ultimate gain may be lost for lack of adequate record. Apart from the necessity of avoiding publication of matter that might be useful to the enemy—a relatively small field this—there is the probability that other wartime activities of engineers may preclude the preparation of long papers to be read before institutions or of books on special subjects. A loss, possibly no less for being more subtle in its workings, is that lines of research which open up all kinds of avenues that would normally be thoroughly explored will naturally be directed towards the main purpose of winning the war. Yet experience teaches that it is often in such side avenues that results of the most enduring value are to be found. It is to be hoped that those who have opportunities of acquiring technical knowledge will regard it as part of their national service to place it on record for the benefit of electrical engineering in all its branches.

Electric Furnaces and A.R.P.

A RECENT publication by the British Cast Iron Research Association, "A.R.P. For Cupola Furnaces," suggests methods of dealing with cupola furnaces in the light of the requirements of the Civil Defence Act, 1939, to minimise risks due to furnace glare or smoke and to enable the furnace to be left while the men take cover, with the certainty that it can be rapidly put into operation again. The two main requirements—effective screening and quick recommencement of operations—may well be met under certain conditions by electric furnaces. There is now no doubt about the efficacy, indeed superiority, of electric melting furnaces, and where such equipment is housed in the ordinary foundry building no screening other than the normal requirements of the building should be called for. With regard to pouring at the time of emergency shut down, it is suggested that this could be entirely avoided with electric furnaces, say, by lifting the electrodes out of the metal in the case of the arc furnace and by simply switching off in the case of the high-frequency furnace. To start remelting from the solid block of metal left in the furnace may not present very serious difficulties, if any, and it would certainly save a great deal of time. During the last war many electrode furnaces were installed because of the superior product offered and because they could be obtained and put into commission more quickly. These are still very good reasons for their installation to-day, and the A.R.P. requirements may well make a good third. Further, since the last war the high-frequency furnace has been developed, and has contributed greatly to the achievements of industrial electric heating.

Restrictions on Expenditure

SOME supply authorities appear to have assumed, or have given the impression to consumers, that no sort of new expenditure can be undertaken. It is true that they have been requested to curtail expenditure, and it is necessary for them to satisfy the Electricity Commissioners that any disbursements are justified by the public need or by war requirements. Into this category fall such matters as supplies to meet a growth of population due to evacuation measures or other alterations in the incidence of demand due to war circumstances and any extensions which would be likely to assist agricultural production. Extensions which had already been promised for an early date are also likely to receive favourable consideration. Schemes already sanctioned for the establishment or extension of generating stations will have to be submitted for reconsideration by the Commissioners, but a new sanction will be given immediately if it can be shown that there has been no change of circumstances. With regard to other works, if the authority can provide good reasons why the expenditure should not be avoided, postponed or reduced, the issue of fresh sanctions will be favourably considered.

Fuel Order Anomalies

HOWEVER carefully an Act of Parliament or Government Order is framed and worded it seems inevitable that anomalies and other points requiring adjustment or elucidation should occur. The Fuel and Lighting Order, which came into force a month ago, is no exception and already several of its provisions have proved that they need straightening out. One of the most striking instances is that relating to prepayment meter consumers. In Section 10-1 (b) it is laid down that the Order shall not apply to electricity taken through prepayment meters at the lighting flat rate. After repeated perusals of the text we can see no intimation that the concession relates to gas consumers, yet in "Explanatory Notes to the Order" issued by the Mines Department on September 20th it is stated that "consumers taking their gas supply through a slot meter will not be rationed." This obviously cannot apply to lighting supplies only, so there seems every justification for the negotiations now in progress for the extension of the concession to cover electricity consumers who receive their heating, cooking, &c., supplies through prepayment meters. And if this extension is secured why should "quarterly" consumers be rationed?

Unrationed Electricity

OWNERS of the 4,000 battery vehicles in Britain already have the satisfaction of knowing that they are making no calls upon the stocks of petrol required for national defence. They have now, in addition, the pleasing knowledge that they may use their vehicles as much as they like, since the Mines Department has decided that electricity taken for this purpose will not be rationed. The reason is that electricity is not, in fact, used on "controlled premises" but on the road. Energy taken for charging the batteries will, of course, have to be separately metered, but this is the normal practice. Quite half of the 500,000 commercial goods vehicles on the road are used for town work with average runs of thirty miles or so a day, which is easily within the range of modern electric vehicles, so that the field for extended use of the latter in relieving the demand for petrol is a very large one.

TEMPERATURE REGULATION

Types of Automatic Control Apparatus

By S. L. Barron*

ONE of the most important developments in methods of production during recent years has been the increasing use of automatic regulation. The greatest advance has been in automatic temperature control, more especially in conjunction with electric furnaces used for the heat treatment and annealing of metal parts.

The rapid growth of interest in this subject has led to the dissemination of some inaccurate ideas as to the efficacy and performance of controllers. Claims have been made, for example, that a straight-line control is possible by using a specified recording regulator, without reference to the design of furnace or the conditions of installation, or that a selected temperature will be maintained within limits of, say, 0.5 per cent. without reference to the conditions under which the controller is to be employed.

Many prospective users are thereby led to believe that a "saw-toothed" record is evidence of a defective controller and a straight-line record the hall mark of a perfect controller. Such ideas could, however, only be true if instead of the term "controller" is substituted the complete installation, i.e., furnace, thermocouple and controlling instrument, and the method and workmanship employed in the installation of the equipment.

Features of automatic control about which misapprehension exists are discussed below. In the first place "hunting," or wide and repeated fluctuations of the temperature record above and below the control point, must be prevented as far as possible, yet a regular small fluctuation giving a fine saw-tooth shape to the record is not only admissible, but may be desirable, since it is a proof of the sensitivity and accurate working of the controller.

A straight-line record can be obtained by artificial means—for example, by lagging the thermocouple, or placing it in such a position that varying temperatures within the furnace are not quickly registered, but this procedure is obviously not desirable.

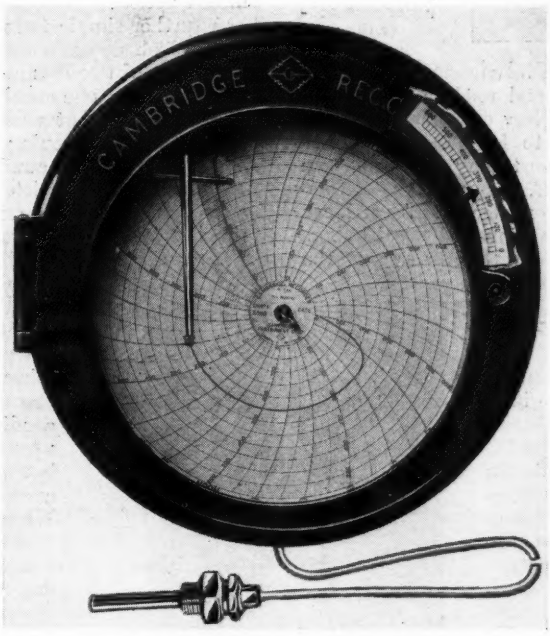
Hunting may be due to various circumstances, but generally it will be found to be caused by one or more of the following:—(1) Highly sensitive thermocouple. (2) Badly positioned thermocouple. (3) Control arranged to cut out too great a proportion of the main supply of heat. (4) Insufficiently lagged furnace. (5) Insensitive or slow acting control unit. The first point can hardly be termed a defect, and provided other conditions are satisfactory, is not likely to cause trouble.

The position of the thermocouple in all but the smallest furnaces may have a definite effect upon the closeness of regulation. In large furnaces the heat cannot be uniform throughout the whole space, hot spots usually occurring near the refractory walls carrying the elements. The position for the thermocouple must therefore be determined with great care, and in large furnaces a number of thermocouples are usually fitted at selected points the temperature being regulated by means of a multi-zone controller.

Undue fluctuations about the control temperature can sometimes be cured by arranging the electricity supply to the furnace so that it is normally not quite sufficient to maintain the desired temperature, and to regulate an auxiliary additional supply to make up the deficiency. By this method great surges of heat are avoided and the control is rendered more uniform.

One of the chief difficulties encountered in obtaining accurate temperature control is the avoidance of overshooting. When starting from cold it is often required to heat up the furnace quickly, and when the control point is reached the temperature tends to continue to rise for some time, although the fuel supply may have been correctly cut off by the controller. This overheating may be avoided by fitting the controller with two switches, one of which operates at, say, 20 deg. below the control point to cut out a proportion of the current, so that the heating slows up. When the control point is reached the second switch operates on the remainder of the supply, and continuous control is effected by means of this smaller proportion of the heating medium.

Within recent years many improvements have been effected in regular design, and modern furnace installations are mostly of such excellent construction that regulation can be obtained within very narrow limits, but when older types of existing furnaces previously hand controlled are to be converted to automatic control then expert advice should be sought if reasonably accurate results are to be obtained. In any case close co-operation between supplier and user of the apparatus is essential.



Thermograph regulator

Types of Regulator

The types of regulator most frequently used fall into two main groups, *i.e.*, those which operate on mechanical, and those which operate on electrical principles. Although either form can be used to control electrical, gas, or oil-fired furnaces, ovens and baths, in this survey they are considered only in relation to the automatic control of electrical apparatus.

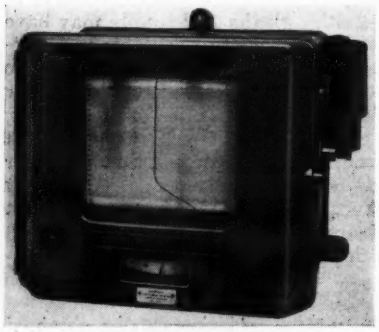
For applications such as the control of sherardising and low-temperature annealing furnaces, plastic-moulding presses, drying or ageing apparatus, where extreme accuracy is not essential and where the temperature does not exceed 600 deg. C., the mechanical type of regulator may be employed. This pattern is available in a variety of both indicating and recording regulators, operating upon similar principles and possessing the features of robustness, accuracy and simplicity of operation, maintenance cost being extremely low. They are particularly suitable for industrial work under severe conditions and may be employed to control electrically heated apparatus at any temperature between the limits of −40 and +600 deg. C.

* Cambridge Instrument Co., Ltd.

The instruments usually operate upon the following principle:—The heat-sensitive bulb, which is exposed to the temperature to be controlled, is connected by a length of flexible or rigid capillary tubing to a Bourdon-pressure tube, the system being filled either with mercury or with a volatile liquid or gas. Changes in the bulb temperature cause changes in the pressure throughout the system, and the consequent movements of the Bourdon tube are registered by a pointer moving over a calibrated dial or by a pen moving over a chart.

Adjustable electrical contacts can be arranged to operate whenever the pointer or pen reaches a predetermined position, corresponding to the desired control temperature. These contacts usually actuate electric contactors which in turn will open or close electrical heating circuits, or bring into action other controlling apparatus.

Providing circuits are non-inductive the contacts fitted to the mechanical type of regulator will usually carry a current of about 0.1 A up to 250 V, which is sufficient directly to operate auxiliary contactors for loadings up to 30 A at line volts. Some manufacturers arrange these contacts to operate mercury switches self-contained in the regulator which enables circuits up to 15 or 20 A to be opened or closed, thus eliminating the necessity of external auxiliary apparatus.



Potentiometer recording controller

The sensitive bulbs of these instruments are usually made of special steel alloy, and modern methods of production have enabled capillary of such fine bore to be obtained that lengths up to 120 ft. or more may now be employed. Errors due to any change in temperature of the capillary itself, assuming that it does not exceed 50 deg. C., may be neglected. A certificate of test issued recently by the National Physical Laboratory referring to capillary tube of this type shows that no correction was required when the temperature of 35 ft. of the capillary was increased from 16 to 40 deg. C.

The simplest form of mechanical regulators of this type are the indicating dial types, which are obtainable with dials varying from 4 in. to over 12 in. in diameter. To the scale pointer is attached an electrical contact, whilst a second contact closing a relay circuit is provided on a movable index which can be set to the temperature at which control is desired.

These instruments are usually employed in conjunction with an auxiliary 15-A contactor, or with a relay and a larger contactor, depending upon the circuit. The contacts of these instruments should give a positive make and break action, thus ensuring reliable operation of the contactor without "chattering."

An operating accuracy of about 0.5 full scale can usually be obtained with this type of instrument. Instruments with dials made of translucent material with internal illumination can be obtained for darkened positions.

The thermograph regulator is a simple, robust and inexpensive instrument that provides a constant record of the temperature on a circular paper chart which rotates at various speeds, the usual duration being twenty-four hours or seven days. Instruments are obtainable with "set up" ranges so that the chart corresponds to the working temperature range, while double regulators fitted with recording systems for controlling and recording temperature at two different points, are also available.

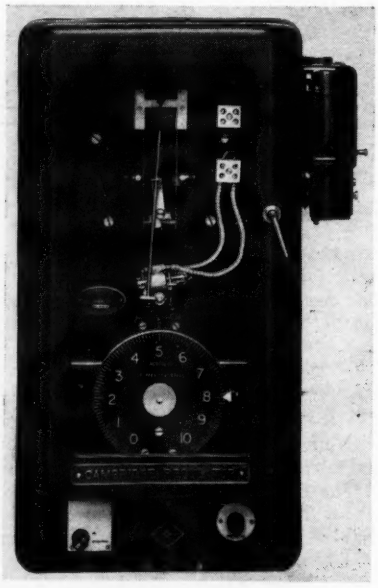
Clock mechanisms are usually employed for driving the charts, but for special applications where AC mains are available synchronous motors can be obtained. The cases can be either wall or flush mounted, and to facilitate changing of charts, devices are often provided which automatically hold the pen clear of the chart as soon as the door is opened.

Direct-deflectional controller

Another form of thermograph regulator combines the instrument described above with a mechanism that varies the setting of control in accordance with any time-temperature curve. The control setting is adjusted by means of a cam rotating at the speed of the chart. The cam can be arranged, for example, to increase the temperature at a constant rate and then, if necessary, to hold the temperature for a predetermined period.

A further simple form of regulator is the bi-metallic type which depends upon the different coefficients of expansion of two dissimilar metals. These metals are rigidly fixed to one another and carry at one end a form of contact, so that when heated the bi-metallic strip bends, thereby opening or closing the contact. The latter may operate auxiliary contactors. This type of regulator has a restricted scope of applications due to a limited temperature range. It is employed in domestic electric ovens, refrigerators and similar apparatus.

Potentiometer controllers are the most accurate type procurable and may be used in conjunction with either base or rare metal thermocouples, resistance thermometers, Fery telescopes, or other suitable electrical means of measuring the temperature or other condition. Normally, they work upon the potentiometric principle, but when used with electrical resistance thermometers they operate as Wheatstone bridges.



Potentiometer controller

Instruments are made to control temperatures from −200 to 2,000 deg. C. When using thermocouples many manufacturers fit an automatic cold junction compensator in the instrument. A broken thermocouple device which switches off the furnace if the thermocouple circuit is broken, thus preventing wholesale spoilage, can often be incorporated.

In this type of instrument any length of connecting lead may be used without affecting the accuracy of calibration; the controller may thus be situated at a position remote from the furnaces. The current for the potentiometer circuit is usually supplied by a dry cell which normally lasts for about a year and need only be standardised once in twenty-four hours; many makers are prepared to fit automatic standardisation devices.

These controllers can be obtained for any voltage and

when they are mounted in positions where light is limited many manufacturers will provide a system of internal illumination.

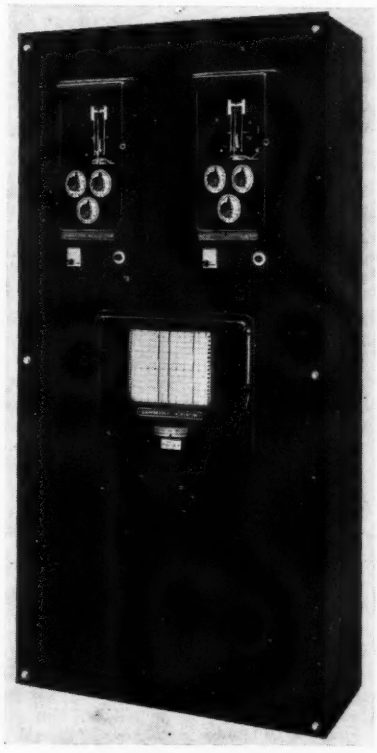
Recording potentiometric controllers of the slide-wire type are available in which balance is obtained automatically by the recorder mechanism instead of by hand adjustment of the contact. Instruments of this type provide accurate temperature regulation and also give a continuous record on a chart, normally driven at speeds of from ½ in. per hr. to 2 in. per hr., the length being sufficient to last for one month. The used portion of the chart may either be automatically wound on a second roller, allowing a considerable portion of the chart to remain visible, or arranged to project through the bottom of the case where it can be easily torn off.

With potentiometric controllers the scale can be "set up" so that the whole width of the chart corresponds to the working range, the minimum range being dependent upon the type of sensitive element used. This feature is of great importance where processes have to be controlled with an extremely high degree of accuracy.

The self-contained mercury switches usually provided in this type of regulator are rated at about 10 or 20 A; for higher currents external contactors are employed. Contacts can also be provided to operate alarm signals, coloured lights or other devices.

Automatic standardisation is now frequently specified on this type of recorder, making the controller completely independent of personal supervision over considerable periods. The standardisation device operates regularly by means of a cam switch and a warning signal visible in a small window beneath the chart indicates when a new cell is required. Such recorders can be obtained to give up to six records on one chart, each of a distinctive colour.

The motor driving the recorder mechanism can also be used to wind the chart clock through a safety device, which obviates the risk of over-winding; thus, in the event of a power failure, the chart will continue to run for several hours, recording the period of the failure. Recording regulators operated by AC synchronous motors also are available where the uniformity of the time scale is of importance.



Typical modern temperature control panel accommodating two three-zone regulators and a three-point recorder

Controllers operating on a similar principle may be used where it is desired accurately to control the temperature without obtaining direct indication or records. The temperature at any time can be determined by rotating the calibrated dial until the galvanometer rests at zero, when the value will be indicated.

The scale of this instrument can be "set up" to any desired figure, the minimum range being dependent upon the type of sensitive element used. In this manner the working range can be spread over a long control scale, thus giving open, clearly marked calibration, with greatly increased accuracy. The manufacturers claim that the accuracy of instrument operation obtainable with this type of instrument is ± 0.1 per cent. of full scale (*i.e.*, 1 deg. for a range of 1,000 deg.). Normally, in standard instruments the self-contained mercury control switches are rated at about 10 A, but regulators with switches which are capable of breaking circuits up to 30 A are available for special applications.

The potentiometer regulator can be fitted with a time-temperature mechanism arranged to vary the setting of the controller in accordance with a time-temperature curve. Control is adjusted by means of a cam which can be rotated at a speed of one revolution in any given period. The cam could be shaped, for example, to increase the temperature of a furnace employed for metallurgical processes at any desired rate to an adjustable maximum, and then, if necessary, could be arranged to hold the temperature constant for a pre-arranged period.

The maximum temperature to be reached can often be set independently of the cam by adjusting a movable stop on the temperature dial. These instruments can be used as ordinary regulators by simply removing the cam and setting the control stops to the desired temperature. The use of such a controller ensures uniformity in different batches which are undergoing processing.

A similar controller but without the time-temperature cam is now available for controlling a number of furnaces or zones of one furnace at different temperatures. It incorporates a zone distributor arranged automatically to switch into circuit each zone in turn. The distributor is usually operated by the driving motor of the controller at a speed that causes the connections to be changed over once every few seconds, giving a complete cycle of control rapidly.

Direct deflectional regulators combine the function of a temperature controller and indicator, the temperature being shown on a clearly marked scale about 10 in. long. The point of control can be adjusted by means of a key which sets a separate pointer to the desired temperature on the scale. A moving-coil movement with a magnetic cushioning device can be fitted for protecting the pivots against vibration and shocks.

When these instruments are used with thermocouples, automatic cold-junction temperature-compensating devices are provided which automatically compensate for ambient temperature variations. Also "broken thermocouple" safety devices are usually fitted, in which the thermocouple employed as the sensitive element forms one arm of a Wheatstone bridge to which is connected a dry battery, the galvanometer being that employed in the regulator system.

Normally the thermocouple resistance is balanced by a fixed coil and no EMF from this bridge device will flow in the galvanometer circuit. Should a break occur in the thermocouple circuit the bridge would immediately be thrown out of balance and the regulator galvanometer deflected to the zero position, thus closing down the furnace. A check is provided by enabling the thermocouple to be readily open circuited and noting the behaviour of the regulating mechanism.

In addition to the normal switching devices, the controllers described above can be fitted with a switch for cutting out some of the furnace heating elements a few degrees below the control point, thus preventing the possibility of "overshoot" occurring with rapid heating and preventing "hunting." A zone distributor allows a number of zones or separate furnaces to be controlled at the same temperature by a single regulator.

An interesting instance of the increasing numbers of regulators that are being employed is the recent installation of forty time-temperature controllers and eight 4-point potentiometric recorders for controlling the temperature of Birlec furnaces used for heat treatment. The instruments are centralised in a specially provided control room, and form what is believed to be the largest installation in this country.

ELECTRICITY TARIFFS

An Attempt at Psycho-analysis

By D. J. Bolton, M.Sc., M.I.E.E.

IT is generally recognised that the price of any article or service in some way results from supply and demand, the supply price being governed by the cost of production while the demand price is governed by utility. In electricity tariff discussions only the former is usually considered, and every tariff figure is commonly supposed to be constructed from an analysis of the costs of supply. The question of whether electricity is worth this figure to the consumer hardly enters the discussion of the matter of charges, or at least only as an afterthought.

This apparent disregard of consumption values proves, however, to be only on the surface. Just as our real motives in life so often prove to be quite different from our ostensible reasons as rational human beings, so the real tariff framework proves very different from the arguments we discuss and the motives we imagine ourselves to follow. Nothing in electricity supply is more striking than this contrast between the ostensible and the actual. Our consumers' engineer sets out to frame a tariff which will pass his costs on to his clients, and which will exactly represent the total expenses at any and every point, and he then proceeds to construct something which bears no resemblance to the cost formula, and can be only very distantly related to costs. Sometimes the tariff is the precise opposite of the costs form, as in the load rate type of tariff in which the price per kWh is reduced when the load factor decreases.

Dealing with supply and demand factors affecting tariffs the author contends that the "pretence of cost justification at every point" should be relinquished, adding that all the cost arguments in the world never sold a single kWh above its market price

The trouble is that there is something not quite respectable about the "swings and roundabouts" principle, or considering "what the market will bear." Yet the supply engineer has to make his living by selling in a certain market however little he may bring it into his deliberations. Demand considerations are not destroyed merely by being disregarded—they become "suppressed." The result is an unfortunate clash between motives real and imagined, and in order to understand the tariff situation it is necessary to evade this respectability censor and discover the real desires that lurk behind the costs façade.

Importance of Demand

When a kilowatt-hour changes hands, not only is demand as big an element in the transaction as costs but it is a more exact and inescapable element. With a flat-rate tariff only about one-eighth of the cost is directly measurable, and precise costs (as distinct from overall costs) are incalculable, whereas demand values are frequently known to a hair's breadth. Thus an undertaking may often sell a kWh below its cost, owing to the wide unknowns of diversity and peak incidence, whereas a consumer will rarely buy a kWh above its value.

Electricity supply is often spoken of as a monopoly, and it is true that the supplier can frequently fix his own price up to a fairly high limit. But it is the consumer who decides how many kWh shall be bought at that price, and he has the final and operative word on the subject. The undertaking is like the House of Commons: it has the legislative powers but my lord the consumer has the ultimate veto.

Market values subsist and determine the case, whether we like it or not, and it is folly to imagine otherwise, or attempt to disregard what we think should not be. A certain curve outside our control (except by such extraneous factors as publicity) connects consumption and price. At 4d. a kWh, say, electricity is competitive for lighting, and a certain sale results; at 1d. it enters another market, and some other response is exhibited. It would be absurd to pitch the price at some arbitrary figure like 2d., with a "take it or leave it" attitude, merely because one's costs indicated this amount. It might halve the profit on the lighting load with almost no increased heating load. We simply *must* consider the market, aim at something definite and pitch our price accordingly, neither higher nor lower.

Let us, at the same time, give up this pretence of cost justification at every point. If our tariff is 4d. for lighting and ¾d. for cooking let us no longer try to prove that the supplies cost these amounts but rather say—"we charge 4d. for lighting because it is worth that, and ¾d. for cooking because at any higher figure we cannot get the cooking load." Cost considerations may be a legitimate reason for not aiming at a certain market—they are surely no reason for aiming badly.

It is true that the consumer frequently expects a cost justification for every figure, but even when he has it he will not pay the figure unless the service is worth that to him. Though he may ask about costs, his real decision concerns values; all the cost arguments in the world never sold a single kWh above its market price.

The householder who finds strawberries priced at a shilling a pound one evening and three-pence the next morning does not argue "costs of production" with the shopkeeper, she argues "values" with herself. She may decide that it is worth while to buy one pound in the evening for dessert and ten pounds next morning for preserving, just as she buys one kWh at 4d. for lighting and ten kWh at ¾d. for cooking. In both cases she weighs up utility values and makes her own decision; she certainly will not buy electric cooking if the other sorts are cheaper and equally convenient, be the costs of production what they may.

Let us be quite clear as to our terms of reference. We are not now discussing the electricity supply framework, but merely the operation within that framework. The suggestion here made to disregard costs for the moment and concentrate on use values is concerned largely with the form and proportions of the different tariffs—not with their overall magnitude. We are not considering what profits should be made but merely where they should be made and where not. Above all, we are certainly not claiming that electricity supply is merely a business and has a perfect right to fleece the public to the limit of its powers. It is a business, that is true, and as such it must supply a needed article at a competitive price, but it is something very much more.

The seller of fountain pens is allowed to charge what he likes for two reasons. First, anyone is permitted to make and sell fountain pens, and secondly, one can, at a pinch, do without fountain pens entirely. If the public, or some portion of it, is willing or can be persuaded to buy for 15s. a pen whose materials and manufacture only cost 1s., then good luck to the enterprise, says the world—and let anyone else try who likes. But if a water undertaking claimed the same privilege and held the public up to ransom—"your money or your life"—for what is literally a vital necessity, such an undertaking would very soon be swept away by popular indignation.

Electricity supply is not so nearly essential nor so monopolistic in character as water supply, but it is sufficiently near in both respect not to be allowed to do just what it likes. It is a public utility, and on this account must profess a public conscience.

Duties to the Public

Such an undertaking has two distinct duties to its public—a positive and a negative one. It should spread the benefits of electricity as widely as possible, and it should not profiteer. Unfortunately, popular criticism of supply undertakings has far too often been concentrated merely upon the negative aspect. If the undertaking *as a whole* charges so far beyond its costs as to result in excessive profits, it may reasonably be criticised. But this is very different from saying that every section of the load must be charged on costs, whatever that may mean.

Probably the nearest parallel case would arise if the Government owned a national theatre and leased it temporarily to a private undertaking for the purpose of producing opera. Such an undertaking might be impeached on either of two grounds, the positive ground of failure to meet the public requirements in opera or the negative ground of charging high prices and making a large surplus. But in the absence of one or other of these, no complaint would lie merely because the undertaking charged 12s. 6d. for stalls and only 2s. 6d. for the gallery. It would not be complained that the stall seat did not

cost this to make, or that the proportions of red plush and gilt did not justify a 5 to 1 ratio of price. On the contrary, the undertaking would be failing in its duty if it did not so differentiate.

There is a certain limited number of people who are prepared to pay the stall price, and it is only by charging them this that the production can be put on, and the larger public served. The stall seats are like the first block of high-yield kWh, and it is essential that they shall be charged at something approaching their market value if a large-scale development is to take place. It is unfortunate that public criticism of supply undertakings almost always fastens on to the lighting rate and makes this the chief ground of attack. As already stated, such criticism is at best merely negative and at worst it is positively

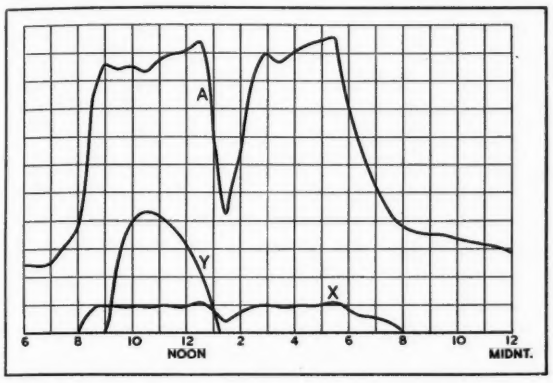


Fig. 1.—Hypothetical industrial load curves: A, aggregate; X, "good" consumer; and Y "bad" consumer

retrograde. A far better ground of complaint would be the absence of a developmental type of tariff with a low running charge.

Costs *v.* Tariffs

All the above argument is merely by way of defence of a practice which is in any case inevitable, and whose results are writ large upon the tariff schedules of this country. In studying the discrepancy, not to say chasm, which yawns between the theory of costs and the practice of tariff construction it is well to distinguish two elements in a tariff, namely its form or pattern and its magnitude. If the pattern is widely different from the cost pattern the chasm is there, however right the magnitudes may be. To put the matter in concrete terms, if we are dealing in a commodity of highly variable density which we sell by the gallon when its costs go by the ton, we cannot be said to be selling on a costs basis, however correct may be the overall balance sheet.

The central fact of electricity supply costs is that only a small fraction of the total expense is directly proportional to kilowatt-hours, 10 or 12 per cent. for a domestic consumer and 15 to 20 per cent. for a power consumer. The remainder is proportional chiefly to kilowats, although some is a fixed *per capita* expense. Moreover, the only kilowatts which affect costs are the net demands on the system, which are quite different from the gross demands of the individual consumers.

When we examine the tariffs we find that very few of them follow the cost pattern. Three out of four meter nothing but the kWh, and the fixed charge, if any, is usually based on some quantity which cannot by any casuistry be called a function of the system demand. It is no mere accident that the characteristic tariffs in each class of supply are those which correspond most nearly to the value of the service rendered in that class.

The typical domestic tariffs are those which charge separate prices for lighting and heating, and those of the all-in variety. In the former case the electricity is charged according to what it is used for*; in the latter case the fixed charge depends on the house size or valuation, *i.e.*, it is related to the probable minimum necessitous consumption, and it therefore expresses the market value of an electricity supply *as such*.

In the industrial sphere there is no such wide variation in the use to which electricity is put, since it is very generally employed in mechanical power production. Differences in market value here concern chiefly the size of the factory, since a large one is better placed than a small one in generating for itself. The popular block-rate tariff precisely reflects these market valuations.

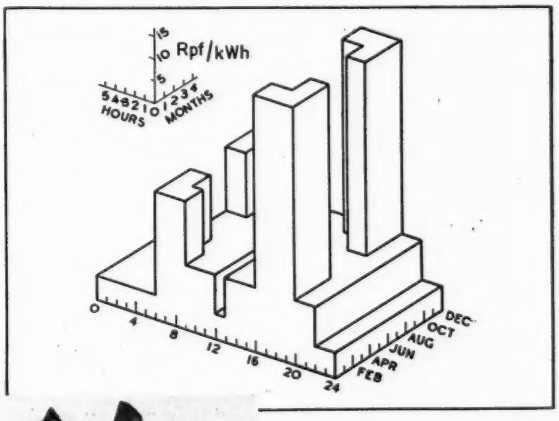
Hopkinson Tariff

There remains only one exception to the above generalisations. The Hopkinson maximum demand tariff is apparently the sole representative among actual tariffs of a strictly cost pattern. Let us therefore examine it more closely and see how far these pretensions hold water. The Hopkinson tariff is a device for charging a consumer according to the badness or goodness of his individual load factor—and the badness and goodness are judged in the purely quantitative sense of low and high. No qualitative discrimination is attempted, and 8 p.m. to 8 a.m. is the same as 8 a.m. to 8 p.m. How far is this a measure of supply costs and system load factor?

Glancing for a moment at the load curve, it is evident that when there are several consumers all with equal demands at the peak time, the one with a high load factor will be cheaper per kWh to supply because he is spreading his load over a bigger number of hours. The plant he is demanding at peak time is being kept in use for a longer period.

If, on the other hand, the consumers are all connected over the same hours of the day, and differ only in the irregularity or jerkiness of their demands within these hours, then the high load-factor consumer will not be proportionally cheaper to supply because he will be more likely to overlap the peak time than the low load-factor consumer.

In practice, this tariff is applied to three distinct groups of



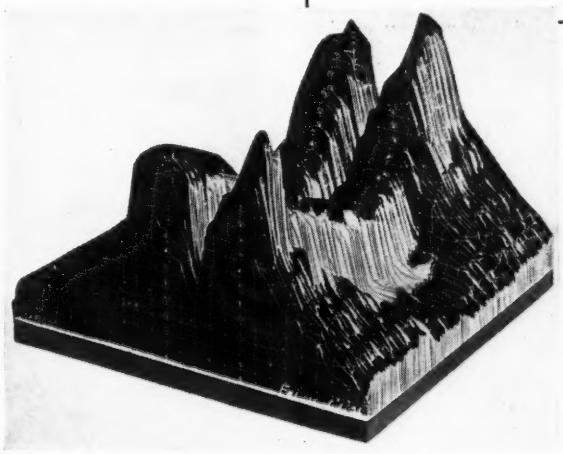


Fig. 2. (above): Three dimensional illustration of a four-rate time-of-day tariff. Fig. 3. (left): "Load mountain" model photographed from the same angle

consumer, namely, bulk supply (with which may be grouped the very large industrial), commercial (shops, offices and institutions), and small and medium sized industrial. Its use in the domestic sphere has suffered a well-merited eclipse. Speaking broadly, it may be said that the Hopkinson tariff is a fair guide to costs in the first and second of these groups but not in the third.

With bulk supply, the purchaser's load curve and the system load curve are sufficiently alike in shape for their difference to be purely quantitative. In other words, the diversity factor is so small that the purchaser's load factor is a safe guide to peak responsibility. With the commercial load, again, the difference in a consumer's load factor may be due to a difference in extension of his use period, and to that extent it will be a fair guide to the costs and the effect

* It is not suggested that there is not (on the average) a difference in the cost of supplying lighting and heating energy, but this concerns such matters as load and diversity factors, time of day, etc. The point is that the tariff is only hypothetically and uncertainly connected with these cost features. It is *directly* levied not on them but on the use to which the electricity is put—a market quantity, not a cost quantity.

on the system load factor. But in the case of the smaller industrial consumers the position is quite otherwise.

It is found that when there are a number of power consumers all working within approximately the same hours of the day, they combine to form a certain kind of load on the system which may be called the typical power load curve. This curve rises rapidly between 7 and 8 a.m. (the actual time varying somewhat throughout the country) and falls between 5 and 6 p.m. Between these times it is approximately flat topped with the exception of the lunch-time trough, say, from 12 to 1.30.

Sometimes there is a slight peak just before lunch, and again just before 5 o'clock, but nevertheless, the curve may be regarded as very roughly rectangular. (This excludes the lighting load which is added when darkness falls within the factory hours). Now, for factory consumers working within these common hours, and with no special tendency to consume at any one of these hours rather than at any other, individual differences of load factor hardly affect the costs at all.

Hypothetical Case

Fig. 1 shows a hypothetical load curve of this kind, plotted from 6 a.m. to midnight, and representing any working day, say, between April and September. The 24-hour load factor of this particular curve is 55 per cent., but allowing for reduced consumption during week-ends and holidays and for a certain amount of seasonal fluctuation, the corresponding annual load factor (excluding lighting) would be 35 to 40 per cent.

This aggregate curve A can be supposed to be made up of a number of individual consumptions, two extreme cases of which are shown at X and Y. These two curves enclose the same areas, each representing a consumption of one-tenth of the A curve. X is a "good" consumer, having an annual load factor (making the same allowance as before) of 28 per cent. His curve, in fact, is an exact reproduction of the A curve on one-tenth the scale but without any night load. Y is a "bad" consumer having a load factor one-quarter as great, *i.e.*, 7 per cent.

On a typical two-part tariff of £5 per annum per kW plus 0.5d. per kWh, consumer X would pay an overall price of 1d. per kWh while Y would pay 2½d. Yet it is doubtful whether (apart from special expenses such as service connections) there is any material difference in the costs of supplying a group of type Y and a group of type X consumers. It is true that ten type X consumers will produce the A curve shown, whereas a very great many of type Y are required in order to get a flat-topped resultant. But granted a sufficient number, they can (and do) produce just this result, and type X (over the same factory hours) will do no better.

In fact, one is almost inclined to reverse the usual judgment as to what is desirable. Consumer X is (for his hours of use) almost perfect, and no matter how many more of the same sort come along they will not materially improve things. Consumer Y is the kind to welcome with open arms since each extra one improves the curve by balancing his fellow's irregularities. He is the type of sinner whose inclusion brings more joy to heaven than the ninety-and-nine of type X who need no repentance.

The same point can be put in another way by saying that the Hopkinson tariff measures and charges for individual load factors but not for individual diversity factors. For the latter it can only make an average allowance for all consumers in the group. But in the case of consumers working within the same daily hours, diversity factors will vary in the opposite direction to load factors and almost to the same extent. The two will then very nearly balance, leaving a constant aggregate load factor on the system.

Private Generation "Yardstick"

It must, however, be pointed out that this diversity is something that only the undertaking or a large consumer can achieve. The small consumer, if he generated for himself, would find his costs rigidly conditioned by his own particular load factor, such as would be metered under a two-part tariff. We thus discover a paradox that in such a case the Hopkinson tariff while ostensibly measuring supply costs is really measuring the competing costs of private generation. It is therefore charging for the electricity according to its use value or market price—which is precisely the position of all the other tariffs on the list.

The whole situation can then be summed up as follows. Owing to the peculiar composition of the expenses of electricity supply, something like four-fifths of the costs are functions of the size of plant employed. Since this size is determined by the maximum load which only occurs at certain particular hours of the day and year, it follows that energy consumed during these hours costs some five times as much as energy taken during any other period. No load which has a diversity relative to the system of, say, 1½ or over can with any certainty be metered for costs under a tariff which neglects time-of-day in its application.

Costs Tariff

Seeing how little our normal tariff forms bear the cost imprint, one may be tempted to fly to the other extreme, and ask what part (if any) costs have in the business at all. The answer is that they play a very important part indeed, though it is a controlling rather than a directing part. Their function is to settle not the form but the overall magnitude, not the details but the aggregate. In the long run, total receipts must pay total expenses including an adequate return on the capital employed. In addition, costs should be sufficiently detailed to furnish some sort of a bottom limit in any direction, and to warn us off any dangerously unremunerative area.

While the above answer is substantially correct as a description of the past and present position, something more may be needed in the future. This something more may lie in the development of what may be called marginal fields, the word "marginal" being used in the economic sense meaning "only just" (*e.g.*, on the margin of profitability).

Taking a broad view of electricity supply development in the domestic and commercial field it is possible to observe three distinct stages, which may be described as (1) lighting and wireless, (2) general domestic (small scale heating and power) and (3) marginal. Stage (1) may be said to be completed when every householder, shopkeeper, &c., is an electricity consumer, and stage (2) is completed when every consumer is on a two-part tariff.

Almost any sort of tariff, even a high flat rate, will secure the stage (1) load provided there are wiring facilities. The second stage may be said to be coming along nicely under our existing forms ("all-in" for domestic, Hopkinson for commercial, &c.). But it is extremely doubtful whether they will serve in those marginal fields where electricity has no obvious natural advantages. Now that the cream of the load has been secured or is on the way to being secured, we must look for some way of making a living out of the skim milk, and time-of-day tariffs may prove to be one such way.

There is no space for a detailed pursuit of this subject, and moreover it was covered in my recent paper before the Transmission Section of the I.E.E. Briefly, it may be said that loads may lie on the margin of profitability either because they are unable to carry any peak charges (*e.g.*, some space heating and large-scale water heating) or because our present tariffs are so divorced from costs that a close quotation is impossible (*e.g.*, difficult industrial situations). Restricted-hour or time-of-day tariffs may help in either situation, either to avoid the peak or to pay for it. The tariff operation may be rigid (using time switches) or flexible (using ripple or other superimposed control).

Example of Exactitude

One must go to the Continent in order to observe the extremer sorts of time tariff. As a supreme example of really "scientific" costing, the tariff illustrated in fig. 2 may be cited. This is taken from the recently published French translation* of the German work "Die Elektrizitätstarife" by Siegel and Nissel. It shows a three-dimensional illustration of a four-rate tariff which charges 60 Rpf per kWh in the evening, 40 in the morning, 15 in the day and 6 at night, the particular times varying throughout the year. In order to show how terrifyingly accurate this tariff really is I have photographed a "load mountain" model from the same angle (fig. 3). Both models illustrate one year's operation, and it will be observed how perfectly they correspond. Whether there is any point in charging the consumer in this way unless he has it in his power to regulate his consumption accordingly, may perhaps be asked by British sceptics; but at least it shows what can be done when one puts one's mind to it.

* La Tarification de l'Energie Electrique." Translated by A.A. Katz, *L'Electrodiffusion*, Zurich, 1938.

Large Siberian Power Station

THE Soviet Government Hydro-electric Planning Department has almost completed plans for the first big power station on the River Irtysn in Siberia, learns *Reuter's Trade Service* from Moscow. The new station will form a big source for the supply of power to the non-ferrous metal works to be established in the Altai mountain district during the third five-year plan. The site chosen for the station is near Ust-Kamenogorsk, which lies in the province of Semipalatinsk near the Tomsk border. The station will have a capacity of about 240,000 kW. Communication roads are already being built up to the site of the new station and a workers' settlement is being erected. It is hoped that the station will be commissioned in 1943.

DEVELOPMENTS IN TURKEY

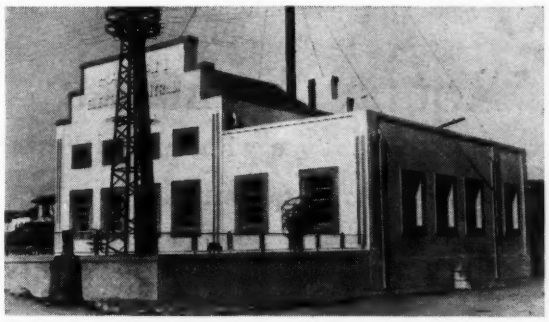
Prospects for Electrical Manufacturers

By Hasan Halet, Sc.M. (Consulting Electrical Engineer, Istanbul)

THE Turkish Republic occupies an area of 300,000 square miles and has a population of 17,000,000, 75 per cent. of which are farmers. The country is situated in Eastern Thrace and Asia Minor, between great ranges of latitude and longitude. The climatic variations are large and therefore a great variety of agricultural products such as wheat, tobacco, rice, figs, grape-fruit, oranges, nuts, &c., grow abundantly. Rainfall varies between 0.4 and 32 in., the maximum being on the Black Sea, Marmora, Aegean and Mediterranean coasts.

Turkey possesses important power resources. Careful studies have shown that the potential water power alone amounts to approximately 1,000,000 HP.

As to coal, in the Black Sea region alone, in the Heraclea zone it is estimated that two billion tons of bituminous coal of 6,500-7,300 cal. exist. At the present time 2.5 millions tons are being extracted each year and measures are being taken to increase this amount to five millions a year within a short time.

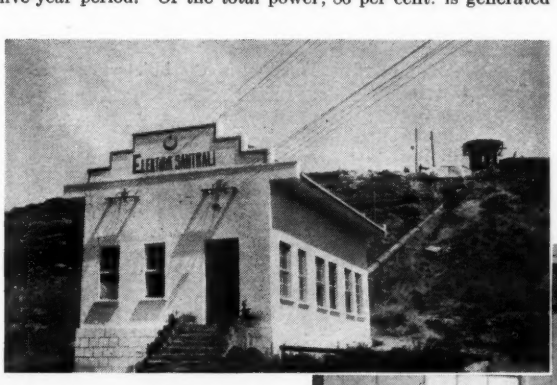


Steam plant serving the City of Havran

There are also deposits of anthracite, lignite, and brown coal. The total estimated deposits of these amount to 1,000,000,000 tons, and part is already being exploited. The country also has petroleum deposits.

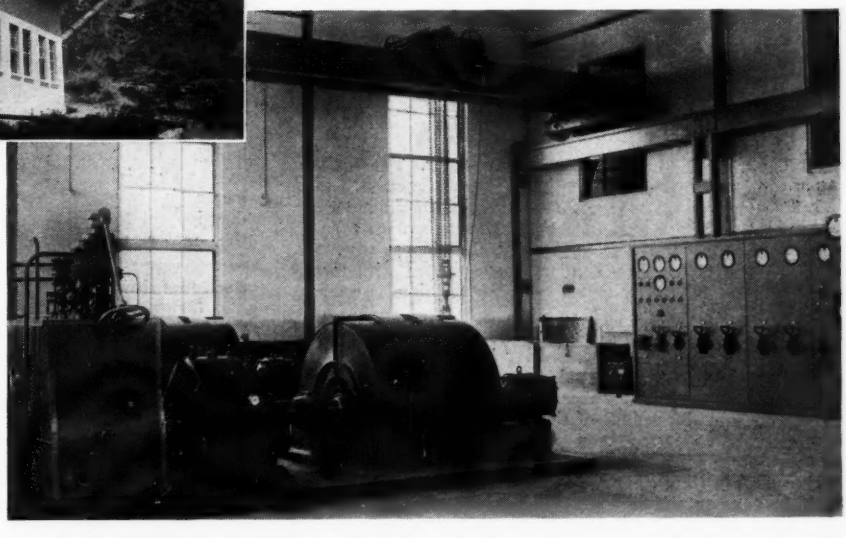
The first city electrified in Turkey was Tarsus in Cilicia. In 1902 a 120-HP hydro-electric power station was built on the river Tarsus and the electrical energy was transmitted at 5,000 V to the city lying at a distance of two miles. In 1914 Istanbul (known then as Constantinople), was supplied with electricity, through a steam turbine power plant of 12,000-kVA capacity.

In 1932 the total installed capacity of the 54 power plants amounted to 99,804 kVA, the available power having been increased by 725 per cent. in the intervening 18 years. The Istanbul plant alone had a capacity of 70,000 kVA. In 1937 the total installed capacity of 141 power plants amounted to 139,144 kVA, showing an increase of 40 per cent. for the five-year period. Of the total power, 86 per cent. is generated by means of steam power, nine per cent. by internal combusion engines and five per cent. by water power.



Tashkopro 50-HP hydro-electric plant

The total electrical energy generated during 1937 was 166,934,000 kWh; 37 per cent. was used for lighting, 53 per cent. for industry and 10 per cent. for street cars. The consumption per capita in 1932 was 5.67 kWh; in 1937 it amounted to 10.3, i.e., it had almost doubled.



Steam turbine station (two 1,250-kW sets) at the Eskishehir sugar factory

Recent Important Work

New steam-turbo power plants of 1,000-5,000 HP are being installed for the industrial plants erected by the Sümerbank According to the first five-year plan the Sümerbank has established large mills and factories for the textile, cellulose, ceramic, chemical and metal industries. These factories produce goods which were being imported before, amounting to 43 per cent. of the total imports.

The existing out-of-date Diesel power plants have been converted into steam power plants and new steam and water power plants have been installed in order to supply electricity to municipalities. So far about 141 cities have been electrified and 35 more are receiving attention.

Under the second five-year plan two large power stations will be built. One of these will be erected at Chatalagzi in the Black Sea coal region with an ultimate capacity of 120,000 kW. Negotiations were opened some time ago with six firms, British, German, American and Swiss.

The first units to be installed are three 25,000-kVA turbo-generators. Power will be transmitted at 66,000 V, to Chatalagzi Harbour (designed by a British firm), and to the Black Sea coal mines. This cost of the scheme will be somewhere in the neighbourhood of £1,250,000.

A second plant is under consideration for Kutahya; it would also have an ultimate capacity of 120,000 kW. Again three 25,000-kVA units would be installed first. This plant would supply electricity to the chemical industry to be established in the zone of Kutahya, to the rich lignite deposits of Seid Omer near Kutahya, and to the cities of Eskishehir, Bursa, Ismit and Istanbul. For this purpose a 220-mile transmission line operating at a voltage of 150,000 would be built. The estimated cost of this scheme is £2,500,000. Tenders for this contract are being prepared by the same firms.

The second five-year plan also provides for the building of about 100 mills and factories, including ceramic and chemical factories, machine shops, food industries, sea products, &c. Medium sized power plants (500-3,000 HP) will be erected in order to supply these industries with electricity. The Turkish Government has decided to provide every city with electricity by 1943. There are at present 300 cities with a population of 2,000-30,000 which will erect their own power plants.

Four Turkish banks are financing these developments under

instructions from the Government. The Agricultural Bank of Turkey with a capital of £100,000,000, the Sümerbank with a capital of £62,000,000, the Etibank with a capital of £3,500,000, and the Municipal Bank (capital, £1,500,000).

Electrical imports consist mostly of machinery and apparatus, cables and conductors, interior wiring material, electrical appliances and wireless sets. Of this equipment 80 per cent. is imported from Germany, 10 per cent. from Italy, and five per cent. from Sweden. Practically speaking there is no electrical manufacturing industry in Turkey, with the exception of one small plant manufacturing cables, and a few others manufacturing conduit and primary batteries. Business is done mostly by direct representation, with the exception of the A.E.G. and Philips, who have branches.

Imports are generally from countries with which clearing agreements have been concluded. Germany being the country which purchased most from Turkey, the clearing arrangements with that country were in the best working condition. It is unfortunate that very little business is being done with Great Britain and imports from that country will only be possible if British firms purchase tobacco, raisins, figs, carpets, wheat, cotton and salt from Turkey. At present imports from Great Britain are being generally made by a system under which a heavy premium has to be paid by the Turkish purchaser, which makes the cost of British goods almost prohibitive except in cases of absolute necessity.

The export of any currency is prohibited. Payment for imports is made in Turkish currency to the Turkish State Bank and credited to the clearing accounts opened with the different countries.

Large British industrial concerns have shown interest in the development of Turkish industry recently, and several large schemes are in the hands of British engineering firms, foremost among which is the iron and steel plant of Karabuk which is being erected by Brassert and Co. Several other schemes are being studied by British firms and it is to be hoped that the good understanding and friendly relations between the two countries will result in a large co-operation in the development of the electrical industry which is of vital importance to new Turkey.

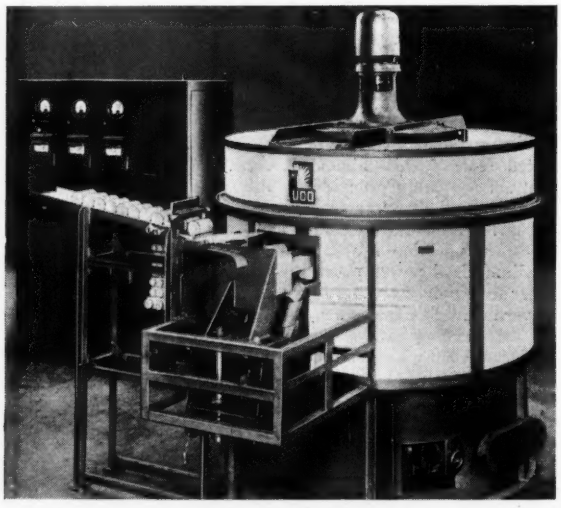
Rotary Furnaces

Low-temperature Type with Special Features

By A. J. G. Smith

THE rotary type of furnace is recognised as an extremely compact and convenient means of heating material continuously. It occupies considerably less space than a straight conveyor furnace and the heating up of the charge is considerably more rapid since it is loaded upon a hot hearth rather than a relatively cold one. An additional economy is that there is less wall surface for the loss of heat. Curiously enough, in the past the rotary type of furnace has been mainly employed for high-temperature operations, such as forging, which have presented certain difficulties from the mechanical point of view, particularly when any attempt is made to seal the hearth.

In the case of the rotary furnaces for the lower range of temperatures up to and including 500 deg. C. it is, of course, important that forced air circulation shall be employed in



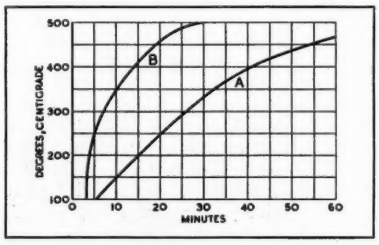
Low-temperature rotary furnace

order to ensure rapid and uniform heat transfer. Exactly how important this feature is can be judged from the chart, which shows that pressings of light metal 3½ in. in diameter by 4 5/16 in. long when heated in a normal oven furnace take 58 min. to reach a temperature of 480 deg. C., whereas when the same work is heated in a similar oven equipped with forced air circulation system by means of a fan the time is reduced to 23 min.

In design, developed abroad for the heating of light metal stampings, pressings and machined parts, the rotary hearth consists of a series of segmental perforated plates in a special heat-resisting alloy, the number of the segments varying with the nature and the weight of the charge to be carried. The segments are supported upon an open angle framework, so arranged as to permit free passage of the circulating air.

The spiral heating elements are supported in the cylindrical central chamber shown, so arranged as to permit a rapid transfer of heat to the circulating air current which is continuously forced by the fan at great speed downward through the work on the hearth and upward through the central chamber in which are suspended the heating elements.

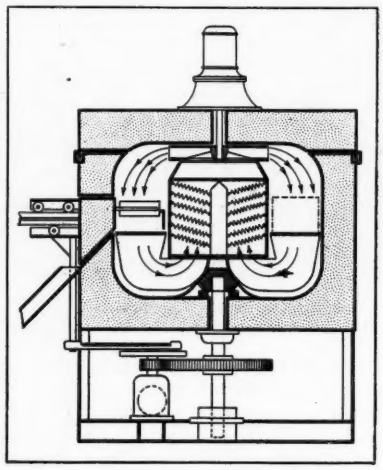
With light-metal billets, the charging and discharging of the



Heating up time for light-metal pressings 3½ in. diameter × 4 5/16 in. long. A, normal oven furnace. B, oven furnace with forced circulation

furnace is entirely automatic, as shown in the photograph. The billets roll down an inclined platform, and are automatically inserted one by one into the furnace by means of a system of levers and a pusher operated from the main drive. Each billet, after being carried through the heating zone of the furnace on the rotating hearth for a complete revolution is on arrival at the opening discharged down the chute shown into the hopper beneath, from which it is readily transferred by the operator to the adjacent press.

As the charging and discharging of the billets must necessarily coincide exactly with the speed of the hearth, both the movements are operated by the same motor. In addition, as such a furnace is usually required to deal with work of considerably varying diameter and length, a stepless variable gear is introduced between the motor and



Sectional view of furnace

the driving gear for the hearth whereby the speed of rotation of the latter can be varied exactly in accordance with the work to be dealt with, so as to ensure the exact heating time necessary for the size of material.

With a furnace 6 ft. 7 in. diameter the output of billets heated to 550 deg. C. is 440 lb. per hour. The overall consumption (including both motors) for work heated up to this temperature is between 210 and 230 kWh per ton.

MAKING DOMESTIC IRONS

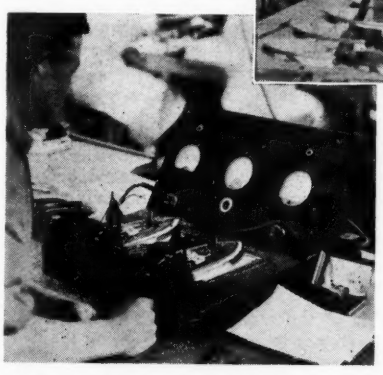
Processes, Adjustment and Testing

FEW companies can claim such a record of rapid progress as Morphy Richards, Ltd. Starting production only three years ago in a small building of about 2,000 sq. ft. floor area which was originally a forage barn, the company has, through its growth of business, been forced almost continuously to extend its factory until it now possesses premises covering nearly 30,000 sq. ft., and further extensions are already contemplated.

Portable electric fires of the reflector type were the first product, and although these have proved very popular it is to the "Auto-control" electric iron that the company owes most of its recent success. The reception which this low-priced thermostatically controlled, streamlined unit has received has been remarkable and the daily production now reaches a thousand, while this month the output was to be raised to 1,200. The irons are sent all over the world and when Mr. C. F. Richards, one of the directors of the company, showed us round the factory recently we saw in course of construction some of a rush order for 1,250 required in seven days as part of an order for 15,000 for Argentina. The company has, in fact, gone to a great deal of trouble to cater for the overseas market and not only the wording on the irons themselves but also special leaflets and other publicity materials are printed in the appropriate language for each country supplied.

The factory is to a large extent self-contained and it is planned to make it more so as time goes on. At the moment, however, the larger stampings and pressings are made elsewhere. When we visited the factory, production was centred almost entirely on irons, but by now attention will have been turned to making fires, including an attractive new design called the "Avon," in readiness for the coming autumn. Four complete assembly lines were being run for the irons, the "flow" system adopted providing for the assembled tops and bottoms to meet each other for final assembly and testing.

The preparation of the flex is the first stage in the assembly of the tops. After it has been cut to the appropriate lengths, an ingenious device which reminded us of a cigarette making machine is employed for fitting the stout rubber sleeves which protect the flex.

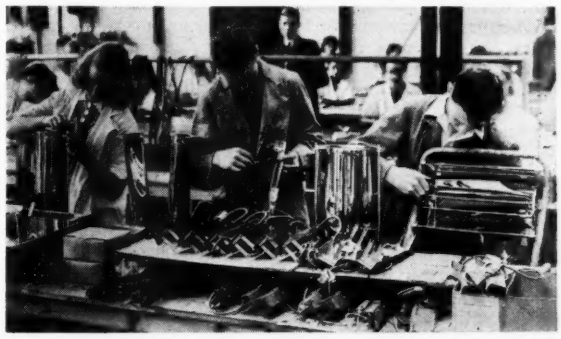


One of the iron assembly lines and (left) testing and adjusting the iron elements

The flex is then fixed into the sides of the heavy bakelite handles which are in turn screwed to the streamlined bodies. These are made either in chromium or in porcelain of various colours—primrose, pastel green and powder blue, the primrose being easily the most popular.

In the meantime the plates, which have bevelled edges designed to slip under the buttons, are being prepared at the other end of the assembly lines. The plates are first thoroughly cleaned out and the bi-metal strips inserted right into the base. The elements are then added followed by the clamp plate. After finishing off, the sole plates go two at a time to have their thermostats adjusted, this being done by setting them at a given minimum temperature. The completed tops and bottoms are then screwed together and the thermostat knobs, the pilot lamps (which, Mr. Richards told us, are one of the iron's biggest selling points) and the earth tags are fitted. Every iron produced undergoes a 1,000-V flash test.

A special feature of the packing is that the boxes are designed so that the irons can be taken out and replaced without spoiling the neatness or effectiveness of the packing. This is a useful point for display and demonstration purposes. Throughout production a system of marking enables every major operation to be checked so that it is possible to tell immediately, for example, who tested or packed any particular piece of apparatus.



Assembling reflector type radiators

The service department is run as a separate unit and is organised in such a way as to give a one-day service in normal times. It speaks well for the company's products that repairs under the three-years' guarantee have been reduced to less than 2 per cent. of the output.

The 250 or so employees at the factory (of whom about a half are male) work under very pleasant conditions and the company has done much to make them contented and to take an interest in their work. A weekly bonus scheme is found to have a marked effect on output and adds between 25 and 50 per cent. to the wages. Holidays with pay have always been given and a pension scheme has just been instituted.

American Wiring Booklets

THE Wiring Committee of the Edison Electric Institute has recently published three booklets, the titles of which indicate their nature. They are "Basic Factors of Adequate Wiring," "Covered Neutral Cable Helps Sell Adequate Home" and "Commercial and Industrial Building Rewiring Market." The first describes in simple language the fundamental requirements for an adequate wiring system and briefly outlines recent developments in installation work which make adequate wiring more economical, both in old and new buildings. The second deals with the covered neutral assembly which consists essentially of conventional rubber-insulated wire surrounded by a stranded neutral which, in turn, is covered with heavy paper and then bound together by an outer braid of the type which has proved satisfactory for many years on non-metallic sheathed cable. The third booklet describes the use of the recently developed thin-wall insulation conductors, bare neutral, increased conduit fill and recircuiting. These various methods can be used separately or in combination to afford a substantial increase in the capacity of existing conduit systems. They merely involve changes in the wires inside the conduits and do not necessitate damage to and restoration of the building as would be involved in change of conduit.

I.E.E. Regulations—VII

CONCLUSIONS

By H. R. Taunton, A.M.I.E.E.

IN those early days when Victoria still was queen, country-house work was the mainstay of many electrical contracting firms, and private plants for historic mansions their not infrequent plums. To-day the great halls and castles are either mental asylums or national monuments; and in any case, the grid can serve them. A few private plants are still installed, of course, and so we have Section 12; but, like Section 9, its necessity becomes less obvious every year. Its few special rules, almost exclusively concerned with switchgear and batteries, will soon be hardly worth a separate heading.

The first five rules are, with slight amendments, the same as in the 10th edition. The note to 1204 has two extra paragraphs amplifying the phrase "effectively connected to earth." It is now, word for word, the same as the long note to Rule 112. Compare also 1005B. The former rule 1206 (earth-testing equipment) has gone. In the new 1206 (secondary batteries) the size of a battery is now measured by its voltage and not, as before, by the number of cells. This avoids a distinction between the lead/sulphuric-acid and the nickel/iron types. In clause C the reference to mineral oil is omitted. Clause E is new, here, and is the old 1343. Rule 1207, formerly 1208, has a new proviso added. Table E, referred to in Rule 1202, is, for the several systems given in column 1, exactly the same as Table 2. A slight modification of the headings of the latter would make a special table for private plants superfluous. The voluminous notes are mostly in the nature of rules, and it would be simpler to write them as such.

Standard Specifications

Section 13 was by far the longest in the 10th edition. In this, its 20 pages have been cut to 7, mainly by the sensible expedient of replacing, in Rule 1301, the former details of sundry equipment by a list of the relevant B.S.S. The one drawback to that is that it throws upon the contractor the onus of obtaining copies of several score of specifications, if he would assure himself that all the material he is installing complies with the I.E.E. Rules. However, in practice he will doubtless, as he has done in the past, be content to rely on his manufacturers to keep him in the path of rectitude.

The list in Rule 1301 gives in certain cases a reference to a following rule instead of to a B.S.S., and it will be found that such rules qualify in some way the specification named in them. For instance, Rule 1302 does not say that solid insulating materials shall comply with B.S.S. 738, but only that they shall conform with its test requirements. It is these special cases that make up most of the rest of the section. Rule 1304 (formerly 1335), dealing with lamps, however, doesn't tell us anything useful. It simply repeats for this particular item the preamble of 1301, without giving the number of the appropriate B.S.S.—presumably, from Appendix 1, No. 161. But why all this camouflage?

Rules 1306 and 1307 should be compared with the former 1307, which mentioned only two types of cable, whereas the new rule has six. A footnote, with a reference to the Introduction, recognises the possibility of other types, particularly mentioning homogeneous t.r. cables. Rules 1308 and 1309 deal with flex, the latter especially with flex for immersion heaters, while the former replaces clauses D and E of the old 1313, with a proviso regarding the earth continuity conductor. This is dealt with in Rule 1311 (replacing the old 1318). Its clause C refers only to earth continuity conductors *not* contained within a cable or flex, whereas clauses D and E of the old rule applied to them as part of a flex or flexible cable. An addition is that the earth wire need not be greater than 0.1 sq. in. cross-sectional area.

Tables and Appendices

Rule 1312 (sockets and plugs) is the old 1329, amended, with the addition of a new clause A giving a special list of appropriate B.S.S. for various types of sockets. Rule 1315 is new. Its clause B, dealing with bonding across non-metallic boxes, is sound; and its clause A is amusing. It stipulates that "material, appliances, fittings, etc., not specifically referred to in Regulations 1301 to 1314 . . . shall comply with B.S.S. No. 816." Considering the many materials or appliances, from antimacassars to zoetropes, not referred to in those regulations, what a very encyclopædic specification that specification must be!

This is the last of the rules, and we are now at Section 14, comprising tables and appendices. We have already commented on all the tables except 17, which is unchanged from the last edition. Nos. 14 and 16, 17 and 18 of that edition have been cut out of this. A similar operation has been carried out on two of the appendices: those on tinning tests and switchboard insulating material. Appendix 1 (B.S.S.) has been considerably enlarged from that in the 10th edition, with 68 entries instead of 37. Incidentally, we learn from it that B.S.S. 816, referred to above, is entitled "Minimum Requirements for Electrical Appliances and Accessories." "Electrical" is the operative word, which Rule 1315 omits.

Appendix 2 (graphical symbols) is unchanged—unfortunately. When this list first appeared and was generally criticised (see, *e.g.*, ELECTRICAL REVIEW, June 3rd, 1932), it was accompanied by a note to the effect that "suggestions for improvement" would be welcomed. There have been suggestions in plenty—it is only too easy to make them—but apparently a "welcome" is all they have had. The list is to-day as it was seven years ago; so we must assume that the B.S.I. deem it incapable of improvement, the one perfect thing that man has produced in all his long history. Appendix 3 (current ratings) remains unchanged except that four sizes are omitted from the tables, and that in D there is a slight decrease in the AC factor for the largest two sizes.

A Word of Praise

Finally, the index. In this edition it is a great improvement on that in the last, in that it is much fuller. It runs to 25 pages for 148 of matter, more than half as long again as the old index of 16 pages, which had to cover 160 of matter. It is pleasant to be able to end on a note of praise. Indeed, although in this review of the 11th edition of the Wiring Regulations certain criticisms have been made, they have been mostly on fairly obvious slips or errors, easily to be remedied. Some of them have been no more than an individual expression of, perhaps, reactionary opinion; and generally they have been less on the subject-matter than on the manner of its presentation, often needlessly prolix and repetitive.

I have been twitted by one or two acquaintances, who have been reading these articles, with what they call my obsession for brevity. If I have rather frequently complained of involved and wordy phrasing, it has been for the good reason that a rule written in twice as many words as it need be, loses half its force. The harangues of sages and statesmen lie forgotten in dusty tomes and blue-books; the pithy proverbs of common life stay with us and help to mould us.

Certainly the writing in the present edition, particularly in the new and amended rules, is an improvement on that in the last; but the hand of the legal draftsman is still to be seen in it. We don't expect brevity from lawyers, fettered by a medieval jargon; nor, truly, from business men, who have to say "we shall be very much obliged if you will be good enough to" when they mean "please"; but we can expect it from engineers, from the men responsible for the issue of our Wiring Rules. Their watchword is "Efficiency": the obtaining of the maximum results with the minimum of the materials best suited to the purpose. Efficiency in writing means, in the same way, using the fewest words that will accurately express the desired meaning; and like all efficiency, it pays. If the Wiring Rules were written in three-quarters of their present space, as they could be, they would be more easily referred to, more easily understood, more easily remembered, and, in consequence, more generally and thoroughly observed.

I.E.E. Activities

AS many as possible of the activities of the Institution of Electrical Engineers are to be carried on during the war. The headquarters will remain at Savoy Place, W.C.2. From October 23rd until November 18th, the library will be open from 9.30 a.m. to 5 p.m. (Saturdays to 12.30 p.m.), after which all times will be half an hour earlier.

During the first half of the session only two formal meetings will be held in London (October 26th and November 26th at 12.30 p.m.) for the election and transfer of members, but a list of papers that were to have been read at ordinary and section meetings, together with a copy of the presidential address, will be issued to members shortly. Advance copies will be obtainable and written comments may be sent in for publication in the *Journal*. It is hoped to arrange a small number of works visits and at least one social function for the Students' Section. With one or two exceptions the committees of Local Centres and Sub-Centres have suspended their programmes.

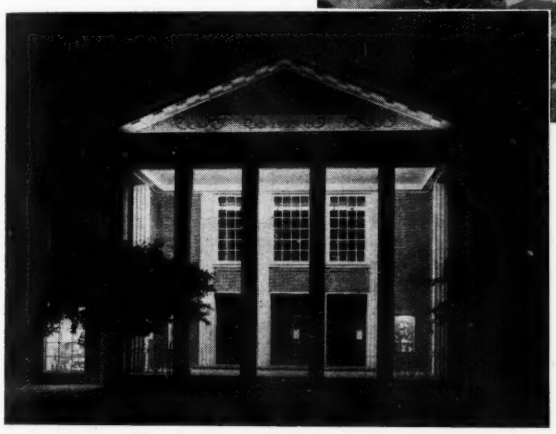
A MODERN STORES

Electric Kitchen, Battery Vehicles and All-electric Flats

IN Welwyn Garden City the modernisation of Welwyn Stores, established in 1921, has taken the shape of an entirely new building costing over £250,000, and this was recently formally opened by Lord Harmsworth. It occupies an L-shaped site covering about three acres, and is practically all-electric. The Welwyn Garden City Electricity Supply Co., Ltd., built and equipped a new sub-station near the site to meet the demand.

The General Electric Co., Ltd., was responsible for the whole of the lighting and fittings in the new stores where the lighting load alone is about 180 kW. The "T.O.T." fittings (combined tungsten and "Osira" lamps), numbering 336, constitute the largest installation of its kind ever carried out by the G.E.C., which also supplied the high-voltage and low-voltage switchgear for the sub-station.

There are four large neon signs reading "Welwyn Stores," one over the main entrance, two others fixed on the top of the coping of the building, and the fourth attached to the wall of the badminton court. Included in the neon installation are the two signs of the "Parkway Restaurant." There are forty-five display windows. The shop fronts have artificial stone piers, marble risers, and a painted wooden façia and cornice in which is set a line of fluorescent discharge tubing running round three sides of the building. About 900 ft. of 20 mm. "Cleora" coated tubing has been used for this purpose. For the windows themselves blended lighting has been adopted, special rectangular close-fitting "T.O.T." ceiling units enclosing two 100-W tungsten lamps and one 80-W "Osira" discharge lamp.



Welwyn Garden City Stores showing (left) the main entrance and (above) the food hall which is lighted by fluorescent tubing

The store itself comprises basement, ground floor, and part of the first floor. Under an artificial daylight effect achieved by "T.O.T." units the natural wax-polished oak counters, stock fittings and panelling show up well. During the daytime the daylight entering the ground floor through "Glas-crete" rooflights from the staircase blends softly with the artificial illumination, all strong contrasts being eliminated. Each lighting unit consists of one 80-W "Osira" fluorescent type discharge lamp and three 150-W tungsten lamps enclosed in opal sphere pendants 18-in. in diameter. All the main selling floors have this type of lighting. The food hall, a separate section on the ground floor, is particularly interesting. There is 1,400 ft. of fluorescent tubing, arranged round the ceiling in three parallel rows—one red tube and two blue—and the effect of this diffused brilliance is enhanced by the green and white chequered flooring, the tiled walls and counter fronts, and other modern fittings.

The kitchen, which serves the Parkway Restaurant, the staff canteens, and the buyers' dining room, is all-electric. Here the conduits and accessories and the switchboard in the control room are all of G.E.C. manufacture, as also are the lighting fittings. All the telephones and luminous signalling devices were supplied by the G.E.C., and similar light-signalling is used throughout the store for calling the attention of managers or other persons required by prearranged combinations of four different colours.

The restaurant provides accommodation for between 300 and 400 people. The ceiling is divided into deep square coffers with a circular mirror and a specially designed G.E.C. semi-indirect lighting fitting in each. Additional lighting is provided by painted metal wall chandeliers in scroll-work. Above the first floor are sixty-two self-contained all-electric flats, built in blocks round the edge of a flat roof. Much G.E.C. material has been supplied to them and all fuse and distribution boards are of that company's manufacture. A separate block houses the Sports Club for customers and residents. This has three badminton courts, with special "Glassteel" lighting fittings, two squash courts with special lighting fittings protected by wire guards, billiard rooms and card rooms, lounge and buffet. The lighting of the offices is by G.E.C. spheres, all fittings having coin bronze finish. There are also many small lighting fittings for counters and local displays. G.E.C. cable, conduit and switchgear is used practically throughout.

The store possesses its own dairy, and a part of its transport fleet consists of Wilson-Electric milk and bakery delivery vehicles. The sprinkler installation was supplied by Mather & Platt, Ltd. The entire electrical installation, including supervision of the kitchen equipment, interior and exterior lighting, &c., was carried out by the Welwyn Garden City Electricity Supply Co., Ltd. Mr. A. T. Bullen is the electrical engineer to the company and he was assisted in this scheme by Mr. A. T. Scotchmer.

"Safety First" in Industry

IN a message to the National "Safety First" Association welcoming its decision to maintain its industrial accident prevention work during wartime, Sir Duncan Wilson, H.M. Chief Inspector of Factories, says that the adverse effect of industrial accidents on national efficiency is probably even more pronounced in wartime than in peace. For war purposes the nation's ability to produce goods and a fighting force depends ultimately on the sum total of people who can be mobilised to work and fight. During wartime there will be many new factors all tending to increase the chances of factory accidents. There is the dilution of skilled labour by unskilled. Even more potent is the invasion of industry by adult workers who are not only unskilled but are totally unused to factory conditions. There are longer hours of work and intensified production; there is probably a greater amount of monotonous work. The educational side of accident prevention will have to be considerably intensified and propaganda will have to be much more widespread if avoidable accidents are not to have a serious effect on national resources.

EMERGENCY ARRANGEMENTS

Contracting and Supply Branches

E.C.A. Announcement

THE Electrical Contractors' Association and its allied Associations decided at meetings of the Council held on October 3rd, upon appropriate measures for the proper operation of these organisations during the period of the war. The meeting was a regular one although slightly postponed so that a certain amount of experience could be obtained on the numerous problems which awaited consideration and discussion.

Only two members were absent due to circumstances quite apart from the war. In addition to the consideration of matters arising in the normal work of the Association some twenty-five items which immediately arose from the declaration of hostilities were dealt with.

It has, of course, been necessary to cancel the Association's annual dinner which was due to take place in January, 1940, and consideration of the 1940 annual conference had to be adjourned *sine die*. The Council in reviewing the activities of the Association since the commencement of hostilities decided to place on record its thanks to the Emergency Committee which had had occasion to look after the interests of members arising from the present emergency.

The Council visualises the necessity of the Association being of the greatest possible consequence to members and while it is intended to conduct its activities on a normal basis as far as it is possible, it had to be visualised that the normal programme of meetings would have to be contingent upon circumstances which it was impossible to foresee. Formal authority therefore was given to the President to convene meetings of the Council as and when he thought fit, and in the meantime the Emergency Committee has been given full powers of the Council, actively to pursue negotiations both in connection with normal work and the special problems which have arisen as a result of the war.

Mr. L. C. Penwell, the Director, tells us that the large variety of the items dealt with make it impossible to supply further information at the moment, but members will be kept fully advised of a number of matters which are of considerable able interest to them as soon as it is possible to make a more definite statement.

E.P.E.A. Decisions

THE National Executive Council of the Electrical Power Engineers' Association has set up a National Emergency Committee, vested with the authorisation and powers of the National Executive Council, for the purpose of the control and administration of the Association. This National Emergency Committee comprises the President, the Vice-President, the National Treasurer and the National Trustees, together with the General Secretary. This National Emergency Committee will function until such time as circumstances permit the holding of a meeting of either the National Executive Council or its General Purposes Committee, and the Emergency Committee may continue to function should the N.E.C. or the General Purposes Committee so decide.

Among other matters, the Emergency Committee cancelled the N.E.C. meeting fixed for October 7th, and has suspended all ordinary meetings of Divisions and Sections until December 31st, 1939, when the situation will be reviewed. Section Committees have been asked to continue to function so far as local circumstances permit, although meetings should only be called when business warrants, and to appoint Emergency Committees to act on their behalf. The officers of the Sections should be authorised to act in connection with matters concerning the members and to make recommendations for submission to the General Secretary if it becomes necessary.

The annual elections of Section Committees, Divisional Councils and the N.E.C. for the current year have been suspended and the members are authorised to continue to act for the year 1940. The Committee or Council concerned is empowered to fill any vacancies which may occur.

The annual subscriptions for 1940 will be the same as for 1939, but a member called up for service with the forces or for full-time employment in connection with civil defence will be asked to pay only half of his normal subscription. The financial benefits for members on active service will be the same as for the ordinary members, and in particular does this apply to the death benefit of the Benevolent Fund. To ease the work of Section Treasurers, the subscriptions of members can be sent direct to the General Secretary.

A definite decision upon matters concerning the National Joint Board Schedule has been deferred until such time as the machinery of the N.J.B. and District Joint Boards under the new conditions has been set up. Area Investigation Committees are to appoint Emergency Committees, and authorise their chairmen and secretaries to deal with matters, if necessary.

It is hoped that by these arrangements the work of the Association will continue with the same efficiency as heretofore. The new national circumstances will certainly involve problems of a character not hitherto experienced and because of this it is not possible to lay down any hard and fast rule as to the procedure in dealing with complaints. Should such problems arise in a particular undertaking, and should there be any element of doubt, the technical representative should communicate with the General Secretary (Mr. W. Arthur Jones), who will be able to deal with the matter in the best way in existing circumstances.

London Technical Meetings

The London Technical Group Committee of the E.P.E.A. has had to decide to cancel the meetings which had been arranged up to and including December 5th. With regard to the meetings arranged for 1940, consideration will be given to these at a later date, in the hope that circumstances may improve so as to enable the meetings to be held. The Committee is endeavouring to secure from prospective authors all papers that have been arranged, with a view to their publication and circulation amongst the members of the Group.

Supply Industry Personnel

WE have received from Mr. A. H. Banks, employers' industrial adviser, N.J.I.C. for the Electricity Supply Industry, the following statement regarding the maintenance of personnel in the industry :—

The National Joint Board and the National Joint Industrial Council for the Electricity Supply Industry have jointly appointed a National Service Committee to study the problem of the reservation of the personnel necessary to maintain the industry in wartime. A deputation from the Committee was received by the Minister of Labour, Mr. Ernest Brown, on September 27th. The deputation consisted of Alderman Walker (Chairman) and Mr. A. H. Banks, representing the employers; Messrs P. S. Jolin and W. A. Jones, representing the technical staff; and Messrs. J. Rowan, M. Hewitson and H. P. Bolton, representing the manual workers. A full and frank discussion took place, and at the conclusion of the interview the Minister expressed his desire to collaborate with the Committee, which represented the whole of the supply industry, and to receive its considered views on any amendments which might be necessary in the Schedule of Reserved Occupations.

The Minister was definite in the opinion that there could be no delegation by the Government of any of its powers in relation to recruitment to any body or person, but subject to this reservation he welcomed the assistance of the Committee, which could furnish expert advice on the very difficult problem of balancing the requirements of the armed forces with those of the essential industries.

The Committee is already in touch with eight undertakings in each of the fourteen districts, chosen for diversity of size and type, and hopes in the very near future to be in a position to submit to the Minister recommendations in relation to any amendments to the Schedule of Reserved Occupations which the industry considers to be necessary, either by way of inclusion of further grades, or alteration of age limits, in order to secure that the industry shall be in a position to meet all demands for essential supplies. It is quite obvious that this schedule is to be the basis of future enlistments, and it is therefore imperative that, so far as is consistent with the paramount requirements of the armed forces, the list should afford the maximum protection to the electricity supply industry.

Those undertakers who do not form one of the eight in each district chosen for inquiry may rely upon a well balanced opinion being formed from something like 112 considered views from a great diversity of types of undertakers, both company and local authority. To make the inquiry from every undertaker in the country would involve a great amount of work, and a delay which would be serious in a matter of such vital importance to the industry.

LONDON'S ELECTRICITY SUPPLY

Wartime Conditions

FEW electricity supply undertakings can be looking forward with any degree of enthusiasm to the prospect of operating under wartime restrictions and regulations. In London the peculiar conditions render the position more than usually disturbing and problematical for the engineers and managers responsible, and unless some relaxation of the restrictions is brought about there appears to be no alternative to an advance in charges for electricity if deficits are to be avoided. Even so, if a rise in prices should unfortunately occur, electricity will still retain its pre-eminent position as the cheapest and cleanest form of light, heat and power.

With the street lighting and shop window lighting gone, with smaller consumption for cinemas, theatres and luxury trades, with both residential and business consumers evacuated and with the possibility of air raids interfering with industrial consumption, it is the general opinion among London undertakings that their contribution to the national economy of fuel is already being made and that there is no need for the imposition of the restrictions requiring certain domestic and industrial consumers to cut down their consumption by 25 per cent. and that the Order might operate only in the case of undertakings in which there is not a reasonable decrease in output.

In any case there are a considerable number of anomalies which must obviously be attended to without delay, the most outstanding being the position with regard to prepayment meter consumers. These are exempt from restrictions only in the case of supplies at the lighting rates. On the other hand, gas prepayment consumers can use unlimited supplies for any purpose. In the circumstances there is much to be said in justification of the view that the Order might be suspended until such time as the anomalies have been considered. This attitude is strengthened by the thought of the countless forms to be sent to consumers telling them what their electricity allowance is to be.

Effect in Residential Areas

Authorities in industrial areas where there may be increased activity due to war work are, of course, not so badly affected as those operating in purely residential districts, though it needs a great deal of industrial load to make up for a lost domestic load. Inner London and the West End are in a particularly unenviable position due to their being so largely dependent on the luxury trades and on the higher class of domestic consumer. Apparently apprehensive of the future, the Metropolitan Electric Supply Co. has taken the precaution of terminating its two-part tariff agreements with domestic consumers as from the end of the year. This does not necessarily mean that it has been decided to abolish the tariff but it leaves the company free to terminate future agreements after three months' notice.

The wholesale evacuation of domestic consumers also brings in its train a host of problems. Evacuees may be divided into two classes, those who have moved out of London privately and those who have gone under the Government's scheme for school children and mothers. In the former instance—and this is especially noticeable in the West End—the people concerned are usually of the "not so badly off" class who are substantial consumers of electricity.

With regard to the evacuation of school-children and their mothers, progressive undertakings who provide free installation of cookers and have either a "unit" charge covering hire of apparatus and energy consumed, or a purely nominal rental charge, come up against another problem. It often happens that the menfolk are the only ones left at home and it is unlikely that they will use the apparatus to anything like the same extent. In order to keep the cookers "out," therefore, it seems probable that these tariffs may have to be suspended or materially lowered. Another incidental difficulty and cost resulting from the evacuation is that there is less frequently anyone at home when the meter reader calls.

The loss of the shop window lighting load is a somewhat severe one to the undertakings, because it is generally a very remunerative one, but it appears likely that this may be compensated for to some extent by more use of lighting inside the premises, many shopkeepers, especially in the Battersea district, having already made inquiries in this connection.

The restriction of capital expenditure to essential needs and war work seems practically to rule out any serious development work whereby an undertaking might hope to recoup some of its losses. The same restriction also applies to the application of surplus revenue, though, in view of the reduced sales of electricity, the rise in the prices of fuel and freightage, War Risks Insurance, and the cost of compulsory A.R.P. work, equipment and staff, it seems unlikely that undertakings need take this too much to heart. With the reduced consumption, undertakings will, it is true, benefit to a certain extent by the saving of total fuel costs, but this will probably be swallowed up by an increased cost of fuel due to War Risks Insurance and the highest cost of production or purchase per kWh distributed. Capital charges remain the same and much capital sunk in wiring installations becomes unremunerative.

The position relating to the purchase by supply authorities of domestic apparatus for hire and hire-purchase also needs clarification. As already mentioned, the Electricity Commissioners have stated that capital expenditure and profits (if any) must be only for public need or on account of war requirements. Can this be considered under this category? If not, there must inevitably be some detrimental change in hire and hire-purchase facilities. In fact, a few undertakings have already discontinued their simple hire terms. To minimise the stock of cookers carried, Battersea Electricity Department has reduced the period in which they are left in unoccupied premises from six to three months.

One further point arising from the Electricity Commissioners' ban on expenditure is that men engaged solely on work of a capital nature now have to be transferred to the revenue side. Consequently the more progressive undertakings suffer once again, for the more progressive an undertaking is, the more revenue is involved. It is, of course, rather difficult to estimate the eventual conditions yet, but the first month of wartime operation shows that in some cases output has decreased by as much as one-third or even more, with a corresponding decline in revenue. Before coming to any decision regarding future policy most authorities are wisely waiting to see what the "stable" wartime conditions are likely to be.

Incidentally, there is a feeling in some quarters that the British Electrical Development Association should not, perhaps, have acquiesced so readily in the Fuel Order, and should have consulted its members more fully as to the probable eventual effect before offering its services so promptly to tell consumers how to economise in the use of electricity.

We understand that the I.M.E.A. has approached the Mines Dept. with regard to the matter of the electric cooking "ration."

Tributaries of Transport

MATTERS which he considered to be "tributaries of transport" were the subject of the inaugural address delivered by Mr. T. E. Thomas (General Manager, Operation, London Passenger Transport Board) as president of the Institute of Transport in London on October 9th.

The president placed staff relationship in the forefront as being one of the factors which could most largely determine the general outlook towards public transport, and consequently affected its destiny. There would be grave reflection upon staff officers if a high proportion of control and official posts could not properly be filled from the lower ranks, and so avoid one cause of discontent and cynicism. The presentation of transport's case to the public must follow closely in order of importance. If the staff had the outlook to be desired transport would be assured of valuable publicity agents.

There was need for traffic planning said Mr. Thomas, and he believed there was tremendous scope for the "manufacture of transport," which if coupled with existing facilities for marketing would provide means of attracting new business at little additional expense. The Southern Railway had "manufactured" electric transport in place of steam and found that it paid. London Transport had marketed a trolley-bus system in place of trams, and that had not been unsuccessful.

Many roads were short of meeting traffic conditions and most railways had a surplus capacity. So long as traffic by rail and road was unbalanced, so long would there be avoidable waste. The remedy was a matter of controversy. Competition had enforced an enhanced standard of convenience. It was also enforcing a higher standard of cost, what time there was much empty accommodation at some periods and shortage at others. Any step to create a more even balance would reduce the cost of service and tend to lower charges.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

LIVERPOOL City Council on October 4th approved the re-engagement of **Mr. P. J. Robinson** as city electrical engineer at his present salary of £3,000 per annum. The engagement will be for duration of war. About three months ago Mr. Robinson intimated his wish to retire.

After forty-six years in the Liverpool Corporation Electric Supply Department, latterly as chief clerk and secretary to Mr. P. J. Robinson, **Mr. A. C. Hansen** has retired on superannuation.

Mr. T. C. Munford, mains superintendent with St. Pancras Borough Council, retired on September 30th on reaching the age limit, after forty-four years' service. A dinner and luncheon were held in his honour and presentations were made by Mr. R. Lee, chief electrical engineer and manager, of a radio set and a suitably inscribed gold watch, to mark the appreciation and esteem in which he was held by his colleagues and the staff. Representatives of every section of the undertaking expressed their good wishes to Mr. Munford on his well-earned retirement and paid tribute to his many qualities which had earned respect and ensured cordial relations between his department and their respective sections.

Mr. Munford (left) receiving a presentation from Mr. R. Lee, Chief Engineer and Manager, St. Pancras Electricity Department

On the occasion of the departure of **Mr. C. H. Stafford,** manager of Burnley, Colne and Nelson Corporations' joint transport undertaking, to become manager and engineer to the Leicester transport undertaking, members of the staff presented him with a silver entrée dish and a silver sauce bowl. Members of the undertakings' social club presented Mr. Stafford with a pipe.

Mr. W. E. Kidner, M.I.E.E., has resigned from the appointment of borough electrical engineer at Barking owing to ill-health, and **Mr. A. B. Catling** has been appointed acting borough electrical engineer. Educated at Colfes Grammar School (Leathersellers Co.), and the Goldsmith Institute, now forming part of the University of London, Mr. Kidner received his practical training with J. Penn & Sons, marine engineers, Greenwich, and the Thames Iron Works. He was engaged on naval transport service during the Boer War as a marine engineer. Following the conclusion of that war he was employed upon the erection of generating plant at some of the first generating stations laid down in the country, such as Manchester Corporation (Stuart Street), Birmingham and Liverpool (Lister Drive). He commenced his association with electricity supply undertakings with Horsham District Council in 1904. Leaving there in 1906, he was with the Leatherhead and District Electricity Co. for a year, and then returned to Horsham as chief assistant from 1907 to 1912. He was appointed deputy engineer to Barking Electricity and Tramway Department in 1912, and continued in this capacity until 1929, except for the war period when for three years he was appointed acting chief engineer during the absence on active service of the then chief engineer, Mr. W. Holmes, A.M.I.E.E. Mr. Holmes retired in 1929, and Mr. Kidner was appointed chief engineer and manager; upon the creation of the borough in 1931 his designation was altered to borough electrical engineer. During his twenty-seven years' service with the Barking Corporation Mr. Kidner has been responsible for much of the development, the sales having increased from 1,538,592 kWh in 1912 to 26,059,897 for the past year. Mr. Kidner was elected an associate member of the I.E.E. in 1908, and became a full member in 1936.

Mr. Catling was educated at the City of Norwich School, Norwich Technical College, and the Royal Technical College, Salford. He served as an articled pupil for three years with the late Mr. F. M. Long, city electrical engineer of Norwich, and remained with the Norwich Corporation Electricity Department until 1926. From 1926 to 1929 he was with the Eccles Corporation Electricity Department, and in the latter year was appointed mains superintendent with the Barking Corporation Electricity Department. After a few months' service he was promoted to the position of deputy borough electrical engineer. Mr. Catling is an associate member of the Institutions of Civil and Electrical Engineers.

Mr. C. F. Wood, managing director of Wood & Son, Ltd., electrical engineers, of Steyning, Sussex, who was due to retire this year, has decided not only to remain in office, at any rate for the duration of the war, but is also planning considerable extensions and improvements of the business. These will include better showrooms and greater workshop facilities.

Mr. M. Marshall has resigned as electrical maintenance engineer at Blackpool electricity works, and **Mr. H. Schofield,** junior engineer, has been appointed as his successor.

Mr. J. M. Skinner has resigned from the board of the Philco Radio & Television Corporation of Gt. Britain, Ltd., and **Mr. F. D. Williams** has been appointed an additional director.

Mr. T. H. Phillips has been appointed a director of Vactric, Ltd., and has been elected chairman of the board.

Mr. G. J. I. Parkin, who was married at Combe Martin Parish Church recently to Miss Daisy Eileen Warren, has been presented with an inscribed clock by Mr. R. S. Jull, manager of the Ilfracombe Electric Light & Power Co., Ltd., on behalf of his colleagues.

Mr. D. J. Thomas, A.M.I.E.E., the new chairman of the South Wales branch of the Association of Mining Electrical Engineers, is a native of Brynamman. He was trained at the Rugby works of the British Thomson-Houston Co., Ltd., and the Manchester College of Technology. He served with the Royal Engineers during the last war and was wounded at Gallipoli in 1915.

The Blackburn Corporation Transport Committee on October 2nd decided on the appointment of **Mr. A. Potts** as general manager. He has held the post of acting manager since the retirement of Mr. J. H. Cowell in January, 1938. The salary is £700 a year, rising to a maximum of £800.

Mr. H. J. H. Riddle has been awarded the Institution Gold Medal by the Council of the Junior Institution of Engineers for his paper on "Thermionic Valves" read before the Institution during the 1938-39 session.

Mr. E. Beaver, a director of the Sun Electrical Co., Ltd., has received a commission in the Royal Corps of Signals, and an informal dinner was given by Mr. A. G. Beaver, managing director, and Mr. R. J. Rawlings, director, at Frascati's on October 3rd, at which his colleagues wished him "God speed and a safe return."

Dr. J. H. Paterson, D.Sc., F.I.C., has resigned his position as managing director of Murex Welding Processes, Ltd., and has joined the Arc Manufacturing Co., Ltd., as managing director. The board of the latter company has now been increased and consists of Dr. Paterson and Messrs. A. C. Wickman, C. D. Gay, A. H. Jarrard and L. M. Neumann.

OBITUARY

Mr. S. H. Allen.—The death occurred on October 4th at the age of fifty-nine of Mr. S. H. Allen, assistant general manager of E. & E. Kaye, Ltd., Ponders End. Mr. Allen had been associated with E. & E. Kaye for over four years, but his earlier connections were with Johnson & Philips, Ltd., as buyer. He was a member of the J. & P. staff for over twenty-seven years.

The late Mr. S. H. Allen

Mr. B. Irving.—The death has occurred in Glasgow recently of Mr. Benjamin Irving, formerly managing director of Sir W. G. Armstrong Whitworth & Co. Mr. Irving was a director of Worthington-Simpson, Ltd.

Mr. P. G. Swann.—We regret to announce the death of Mr. Percy G. Swann. Mr. Swann was a well-known figure in engineering circles. He was connected with the South Wales Power Co. scheme in its early days and was associated with the Federation of British Industries at Bristol.

Acting Pilot Officer J. B. Ellis.—We learn with regret of the death on active service of Acting Pilot Officer J. Baxter Ellis, son of Mr. and Mrs. H. S. Ellis. Mr. H. S. Ellis is well known in the electricity supply industry as chief engineer and general manager of the West Gloucestershire Power Co., and many of our readers will join us in expressing deep sympathy for him and Mrs. Ellis in their great loss.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electricity and the Fuel Order

With reference to the leading article entitled "Electricity in the Home" in your October 6th issue, it would appear that the provisions of the Fuel and Lighting Order have been misunderstood.

The writer cannot find from the Order that a change from coal or gas to electricity in equivalent value is permissible. The Local Fuel Overseers may vary the basic quantities of gas or electricity, should they be satisfied that this is necessary in view of the reasonable requirements, but this would appear to refer only to cases where an increase is desired on account of additional personnel living in the premises, or similar reasons.

Is not one of the main purposes of the Fuel and Lighting Order to encourage the use of electricity for industrial purposes, whilst utilising to the fullest extent possible gas and coal for domestic purposes? W. V. S. SCOTT,

Bourne, Lincs, *October 7th.* *District Engineer.*
Mid-Lincolnshire Electric Supply Co., Ltd.

[Although, as we have said, the wording of the Order is very obscure we feel that we are justified by Article 12, paragraph 2, which reads as follows:—

"The Local Fuel Overseer shall, if satisfied at any time after the date on which this Order comes into force on the application of the occupier of any controlled premises—

"(a) that there is not at that time in those premises any range or stove consuming coal or gas and designed or adapted for cooking, and

"(b) that if there had been no such range or stove in those premises at the date on which this Order came into force, a notice sent by the undertakers under the last preceding Article in relation to those premises would have stated such primary quantities of electricity as are specified in sub-paragraph (a) of paragraph (5) of that Article,

"give notice thereof to the undertakers and the said notice sent by the undertakers shall have effect as if the primary quantities of electricity so specified were stated therein."

The sub-paragraph referred to relates to the fixing of the "primary quantity" of electricity for premises in which cooking is exclusively by electricity.

A passage in the preceding article may be interpreted as having a similar effect. Article 11, paragraph 8, states:—

"In relation to any premises to which during the standard year or a part thereof gas or electricity, as the case may be, was not supplied, but to which a supply is given at the date on which this Order comes into force or at any time thereafter, this Article shall have effect with the following modifications:—

"(a) quarters shall be periods of approximately 13 weeks each, beginning on the dates on which the undertakers propose to read the meter,

"(b) the said notice shall state the primary quantity for each quarter; so however that the Local Fuel Overseer may by notice in writing direct that the notice shall state such basic quantity for each quarter as he thinks appropriate, and

"(c) where the supply is first given after the date on which this Order comes into force, reference to that date shall be read as reference to the date upon which the supply is first given."

We do not agree that one of the main purposes of the Order is to discourage the use of electricity for domestic purposes. Our belief is that it is designed to ensure the maintenance of distribution of energy in whatever form, and surely from this point of view it is better to deliver energy from central stations than through a multitude of coal distributors.—EDS., ELEC. REV.]

Lighting Prepayment Consumers

In the explanation of the Fuel and Lighting Order as applying to the rationing of electricity you say "the Order does not apply to consumers obtaining electricity through a lighting-prepayment meter." This does not properly explain the position, since a consumer taking lighting through a prepayment meter with nothing else in the premises but lighting would not be exempt if that prepayment meter was of the two-part tariff type. W. J. COOPER,

Hamilton, *October 2nd.* Burgh Electrical Engineer.

[In a reply to Mr. Cooper we mentioned that the phrase was used for the sake of clarity and suggested that extremely few domestic consumers adopted two-part tariffs for lighting only. To this Mr. Cooper replied as follows:—

From your letter it would appear that it is not yet recognised to what extent two-part tariff prepayment meters are being adopted. It may be of interest to you to know that in this undertaking 36.5 per cent. of the total consumers are residential consumers and in that class of consumer 84.6 per cent. are using two-part tariff prepayment meters. In a three-roomed house on our two-part tariff a consumer using the minimum ration amount of 200 units obtains the supply at an average price of 2.83d. per unit whereas the flat rate is 5d. per unit.

You will see from these figures why so many lighting consumers take the supply on a two-part tariff and in our case generally, for this size of house, by prepayment meter.

Hamilton, *October 5th.* W. J. COOPER.

[Mr. Cooper implies, although he does not actually say, that 84.6 per cent. of his residential consumers use electricity for lighting only through two-part tariff meters and get it at a very low price. Such a tariff is uncommon, as the fixed charge usually bears a close relationship to the cost of lighting at the flat rate, the running charge being an extra. As a "promotional" tariff it may induce consumers to go on to other uses. If it has had this effect in Hamilton then surely the people concerned cannot be regarded as mere lighting consumers and our contention that few two-part tariff meters are employed for lighting only by domestic consumers is justified. —EDS., ELEC. REV.]

Supply to Smallholdings

With reference to the article in your issue of September 29th, regarding combined high- and low-voltage distribution, the construction department of Spalding U.D.C. carried out a similar scheme for the Land Settlement Association here and also a fourteen-mile run to other small villages some two years ago.

One improvement we adopted (at least in our opinion) is that instead of having porcelain bushings on the transformers on the live 6.6-kV side we took a lead-covered cambric-insulated lead from the top conductor with special sealing ends into the transformer tank by means of a plumbed gland. The advantage is, of course, that we can work on the low-voltage conductors without making the transformer dead.

FRANK R. C. ROBERTS,

Spalding, *October 5th.* *Engineer and Manager.*

Restricted Motor-car Lighting

Cylindrical covers for motor-car headlamps are being devised in order to prevent light showing upward *via* the reflector. I can see no real necessity for so elaborate a device. If a sheet of cardboard or metal is cut so as to provide louvres the light cannot show above a certain angle, provided, of course, the sheet material is non-reflecting. The gap at each end where the material is cut back can easily be covered.

An additional advantage is that a rectangle of light is given immediately in front of the vehicle and a spot some distance ahead, thus showing up the curb and any obstructions. The width of the rectangle is, of course, governed by the slope given to the louvres. I have found this method quite satisfactory on the road. H. L. DAVIS, Grad.I.E.E.

Mickleover, Derby, *October 4th.*

Lighting Considerations

With reference to "L. S. B.'s" letter in your issue of October 6th I would point out that the statements in my previous letter were not "opinions," but statements of fact, though they have been denied often enough by those with less experience. Statements made by prejudiced parties, who can hardly be called "authoritative," have certainly, as "L. S. B." says, been "repeated sufficiently frequently" and have, therefore, "come to be regarded" by many, including, apparently, "L. S. B." himself, as "having a basis of fact."

The illumination values recommended in the I.E.S. Code and E.L.M.A. handbooks are indeed a result of worldwide experience—of salesmanship. Personally, however, I am not in the least interested in the sale of either lamps or current. My sole purpose is to interest the public in the important subject of lighting in a simple but intelligible manner. Incidentally, I do not "prefer to use my individual experience." I merely expound the laws of nature, as confirmed by the experience of innumerable other persons known to me. If the "authoritative tables" which he mentions have been accepted as such by the Government, it is because the Government are not themselves technical experts and have not accepted these tables as a result of independent investigation and confirmation,

but merely because the figures advocated have been "repeated sufficiently frequently."

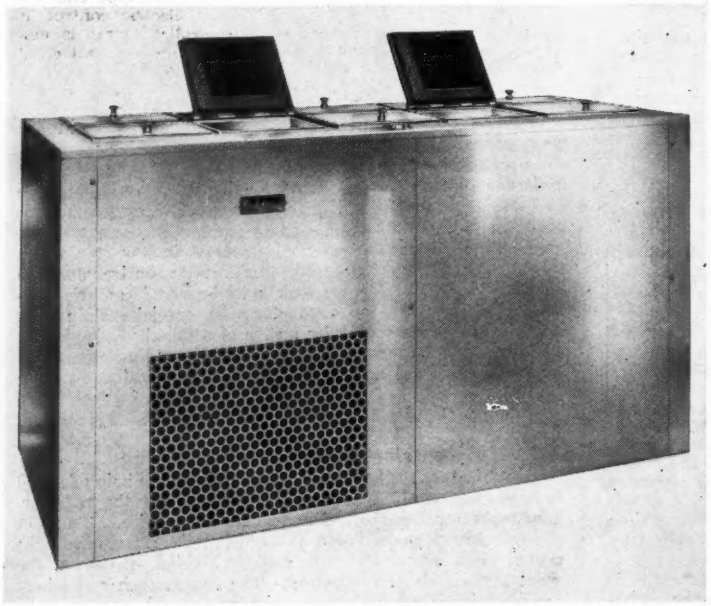
I should like to ask "L. S. B." to take a photometer round his own house, office, or factory, and those of any friends or associates, preferably members of the bodies whom he quotes, and measure the intensities in all positions and facing in different directions, including, of course, with his back to the source of light, and let us know the maximum, minimum, and average readings. I think he would get some "illuminating" results and would find most of his readings well below those I advocate (4- or 5-ft. candles as a rule). He says it is "extremely doubtful whether indirect light is to be preferred to direct light" for most factory work, but he gives no reason whatever for his doubts. Most factories are purposely designed by the architect for north daylight, which is completely indirect lighting, being derived from the sun by reflection from the sky, direct sunlight being seldom or never desired.

A factory manager might be well advised to "pay more money for half the quantity of light" if he has been using double the quantity necessary and can be shown how to obtain equally good or better illumination with half; he will soon save the said "More money" and yet more again in running costs. With regard to localised lighting, true, Mr. Robinson did not say that it was unnecessary in the daytime in textile mills, but it obviously is so as a rule, where the building is properly designed for daylight. Of course, there are exceptions to every rule, and the fact that there are cases where some artificial lighting is desirable even in daytime, as mentioned by "L. S. B.," is not in conflict with my statement that it is not normally required and therefore that localised lighting should not normally be required at night if the general lighting resembles daylight in its even distribution and diffusion. Similarly, with regard to directional light, which may certainly be desirable in special cases, but these are merely the exceptions which prove the rule, namely, that indirect lighting is the ideal in most cases and for most purposes.

London, W.C.2, *October 9th.* G. V. DOWNER.

Refrigeration in Blood Storage

THE Ministry of Health and the Medical Research Council have for many weeks been engaged on the problem of obtaining and storing blood for transfusions. Medical experiment has proved that the value of stored blood is almost invariably as high as fresh blood. For this reason its use has been universally accepted. But experience both in Russia and Spain has shown that the process of withdrawing, storing and distributing must be undertaken by centres specially equipped for the purpose, if satisfactory results are to be obtained. Depôts with first-class facilities are now being established all over the country. London, for example, has four centres in safe Home County districts. Each is equipped for the storage of 1,000 bottles, together with apparatus for blood collection and administration. Refrigerated vans will be used to distribute blood from these centres to wherever it is required.



Coldair cabinet

Perhaps the most interesting part of the business seems to be the use of refrigeration for storing the blood when withdrawn and transporting it where necessary to a place where casualties need treatment. Coldair, Ltd. (an associate of the General Electric Co., Ltd.), has been experimenting with apparatus for this purpose for some time, and it is now marketing a complete range of special cabinets.

Pints and quarts being the commonly required amounts of blood, the cabinets have been designed to accommodate bottles of the larger capacity, to cover both needs, and the four sizes available provide storage for 10, 30, 60 and 90 quart bottles. To guard against the introduction of infection, great attention to hygiene has necessarily to be studied in every detail. The medium-hard rolled copper storage compartments which are tinned on the interior have the advantage that, not only are they very easily sterilised, but they resist the constant scouring necessary. The large sizes have partitions fitted in the storage compartments which allow bottles containing blood of different groups to be conveniently segregated.

As it is detrimental to the value of the blood if it is shaken after bottling, the Coldair apparatus is arranged to guard against this. The ideal temperature level has been found to be between 34 and 38 deg. F. and the Coldair apparatus has been designed to maintain it steadily. A dial thermometer is fitted on all models in a clearly visible place on top, so that absolute security against remotely possible mishaps affecting temperature may be assured. Where required, a warning bell to signal should the internal temperature rise above 40 deg. F. can also be included in the equipment.

The storage cabinet has a finish in white enamel throughout. The top is hard baked to withstand handling in all models, except the 10-bottle size which has a stainless steel deck.

The refrigerating unit is completely enclosed in the base of the cabinet, which saves space in installation, and makes for a generally neat appearance. Refrigeration is obtained by means of a standard reciprocating self-lubricating twin-cylinder compressor controlled by an electric motor. Seamless copper coils and 3-in. compressed baked cork insulation are also included in the specification. A perforated grill or a louvred panel is inserted in the face of the cabinet to facilitate full air circulation for the compressor unit. Thermostatic control is, of course, common to all models. A thermostatic expansion valve and double seated service stop valves are also fitted.

Standby A.R.P. Lighting

THREE more British Standard Specifications relating to wartime lighting have been issued with the approval of the Home Office by the British Standards Institution from which copies are obtainable. The first of these is a revision of BS/ARP 6 (8d. post free), which covers the lighting of shelters for up to 200 persons and now includes cases in which public supply is from DC as well as AC mains. A new Specification, BS/ARP 17 (1s. 2d. post free) for larger shelters, is based on the principle that a self-contained generating set as stand-by is advisable in addition to the battery which is by itself considered satisfactory for small shelters. Particulars are given of the plant and charging equipment together with the number and wattage of lamps required.

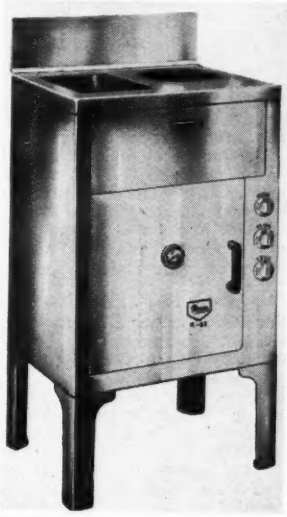
Report and control centres are the subject of BS/ARP 7 (8d. post free). Normally the lighting is taken from the mains at full voltage. Emergency lighting is provided through a separate wiring system from a 24-V generator driven by an internal-combustion engine supplemented by a battery. The latter (which can, if necessary, supply the emergency lamps for four houses) is switched on by hand when the mains supply fails, and switched out after the generator has been run up. The ventilating plant (normally motor-driven from the mains) can be mechanically coupled to the generating set. When the battery only is working the ventilating plant is manually operated. A small fan should also be provided in each room where several persons are working.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Revo Cookers

FLUSHLINE is the appropriate name of a new range of cookers marketed by the REVO ELECTRIC CO., LTD., Tipton, Staffs. Both inside and outside, ell ledges, crevices, projecting panels, screws and bolt heads, &c., have been eliminated, thereby simplifying considerably the task of keeping the cooker clean. The "no projection" design also renders the cooker ideal for the small kitchens common to-day, since it is designed to fit easily and neatly into corners and recesses.



Revo "Flushline" cooker

The large-capacity, one-piece oven interior, which can be pulled out for cleaning, incorporates rack runners pressed into its sides in such a way that the racks cannot tilt. The door is flush fitting and provided with a self-locking catch.

Open elements are situated behind sides and bottom of the oven, and are controlled either by three-heat switch or "Revostat" automatic heat control. The cooker side panel is removable to give access to the wiring and fuses.

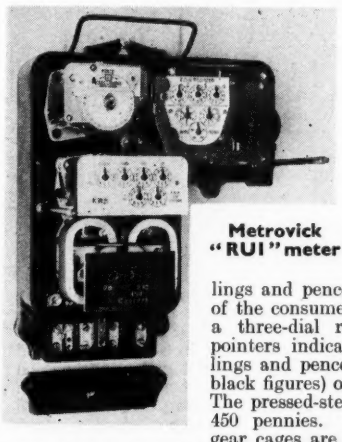
Boiling and grilling units are of the plug-in type and special care has been taken to protect the plug sockets from spilled liquids. In the one-piece sheet metal hot cupboard the boiling unit supports have been reduced to a minimum and form an integral part of the unit. Here, too, the corners and edges are all rounded.

The general construction of the cooker is robust, the front, base, hob and legs being of cast-iron, while the sides and back are of heavy-gauge sheet metal. Standard colours are mottled grey or mottled cream and green vitreous enamel, other finishes being plain cream and green and all-white. All the door handles, switch knobs, &c., are finished in colours which harmonise with the general scheme.

So far three models are available to meet the cooking requirements of up to eight persons. The total loadings are 5.9, 7.1 and 7.4 kW, the oven loadings being 1.9, 2.1, and 2.4 kW. All three models have as standard a 2.2-kW grill-boiler and 1.8-kW 8-in. solid boiling plate, the two larger models having an additional 1-kW, 6-in. plate.

Two-part Tariff Prepayment Meter

Type "RUI" meter has been designed by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, for collecting a fixed charge based on time (nominally for rent) as well as payment for the kWh registered. The principal feature of its prepayment mechanism is an orthodox epicyclic differential, driven by passing a coin through the receiver into the coin drawer, and by the rotation of the meter disc and the pinion of the timing element, these quantities being first summated by means of an auxiliary epicyclic differential.



Metrovick "RUI" meter

A dual-coin receiver accepts either pennies or shillings, and a three-dial coin register records the amount paid into the meter in pounds, shillings and pence up to £10. The state of the consumer's account is shown on a three-dial register; on this three pointers indicate the amount in shillings and pence up to 20s. prepaid (in black figures) or owing (in red figures). The pressed-steel coin drawer will hold 450 pennies. Standard price-change gear cages are adaptable for all prices from ½d. to 6d. per kWh in steps of ½d. up to 2d. per kWh and thereafter in ¼d. steps; for prices above 6d. special cages are available.

The fixed charge to be collected is determined by the setting of a dial (in some cases two dials) bearing figures that represent pence per week. The operative rent appears behind a window in the meter cover and five standard ranges of weekly rent are available: up to 2s. in ½d. steps; up to 3s. and 4s. in 1d. steps; up to 6s. in 2d. steps; and up to 8s. 9d. in ½d. steps. Any of the first four ranges can be accommodated on a single-dial rent attachment; for the longer range a two-dial attachment is used. The rent setting is adjusted by means of a screwdriver inserted through a hole in the meter cover.

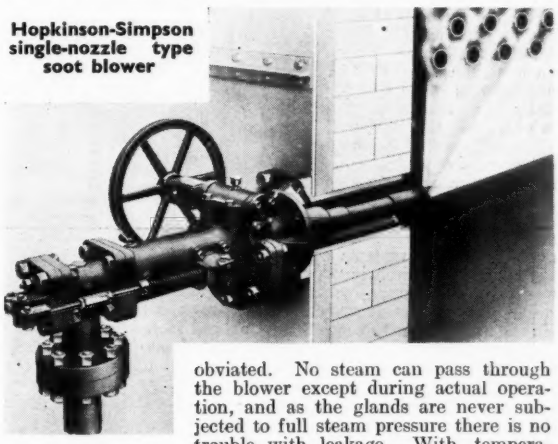
The timing element which measures the rent due consists of a self-starting synchronous motor and the watt-hour meter element is the same as that fitted to the Metrovick type NE quarterly house-service meters. The complete prepayment meter is housed in a moulded-bakelite case. Separate sealable devices are provided on the terminal cover, the meter cover, and the rent-setting device.

The meter is made for nominal full-load currents from 2½ to 20 A and for usual system frequencies and voltages up to 250 V. All sizes carry liberal overloads and the switch breaks currents up to 50 A. The meter complete weighs only 10½ lb.

Modern Soot Blowers

The "Hopkinson-Simpson" patent soot blower introduced by HOPKINSONS, LTD., Huddersfield, has been standardised in two main classes, the single retractable nozzle type and the multi-nozzle type, operated by hand or electric control as required. In the latter case a small electric motor is embodied, with distance push-button or sequence control if desired.

The valves and seats are of "Platnam" metal, and the nozzles of special heat-resisting material. The single retractable nozzle type is intended for installations where space is available for its efficient operation, and particularly where high gas temperatures are experienced in combustion chambers, or in the neighbourhood of superheaters. By the automatic withdrawal of the nozzle from the gases, when not in use, damage by burning is avoided, and the necessity for frequently dismantling the blower for nozzle replacement is obviated. No steam can pass through the blower except during actual operation, and as the glands are never subjected to full steam pressure there is no trouble with leakage. With temperatures of over 1,800 deg. F. a simple methed of protecting the nozzle from burning, such as admitting cold air, can be adopted.



Hopkinson-Simpson single-nozzle type soot blower

The multi-nozzle type of blower is for installation where the space is not sufficient for fitting the single-nozzle type, and for lower temperature conditions, such as in economisers and the last passes of water tube boilers. In operation the rotation of an inner hollow spindle causes a ported cam to open the totally enclosed spring loaded valve, and thus allow steam to pass to the nozzles in the element. A flexible fluid-tight coupling allows for inequalities of expansion between the blower head and element and enables the latter to be adjusted without dismantling the blower head or pipe-work.

Additional features of these soot blowers include a special design of nozzles to ensure steam economy, and ease and quickness of operation, facilitated by remote control through extension spindles.

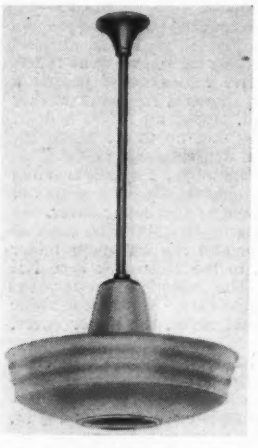
Emergency AC Supplies

In view of the possibility of the mains supplies being interrupted, TECHNICAL INVENTIONS, LTD., Terminal House, Grosvenor Gardens, London, S.W.1, has brought out a compact and portable new model of the "Rotaceptor" for producing the equivalent of mains AC at 230/240 V from either 6- or 12-V accumulators.

This "Type G" unit, as it is called, measures only 5½ in. by 5 in. by 7 in. and weighs approximately 6½ lb. Two sizes giving a maximum AC output of 60 and 100 W, respectively, are at present available and it is hoped shortly to introduce machines with outputs up to ½ kVA.

Domestic Lighting Fittings

A departure in the design of domestic lighting fittings has been made in some of the latest models just announced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.



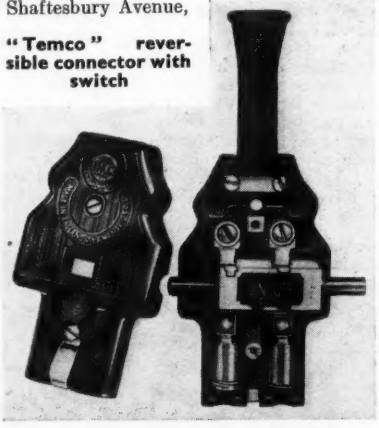
In two new pendant fittings particularly suitable for small dining rooms the bowl is suspended on the rim of a shade which has the top part frosted while the lower part is of clear glass.

They are obtainable with champagne or pink glass and the result is an attractive combination of semi-direct and direct lighting. The rod suspension can be obtained either in antique brass or chromium finish. The overall length of these fittings is 24 in. or 30 in. respectively.

Two three-light pendants of the bowl type are also announced. These incorporate champagne or pink bowls with a sparkle effect which is an alternative to the usual coloured flashed opal.

Reversible Connector with Switch

Although there is no actual B.S. Specification covering a reversible connector with switch, the new "Temco" connector marketed by T. M. C. HARWELL (SALES), LTD., 233, Shaftesbury Avenue, London, W.C.2, is built to B.S.S. 562 — 1934 and B.S.S. 816—1938 where applicable. The latter specification prescribes that "the insulation resistance at 500 V DC between parts not normally in electrical contact shall be not less than 100 megohms": actually in tests taken on the "Temco" connector, it is claimed, the insulation resistance was infinity. All the connectors are tested at 1,500 V AC, samples successfully passing tests even at 2,000 V AC.

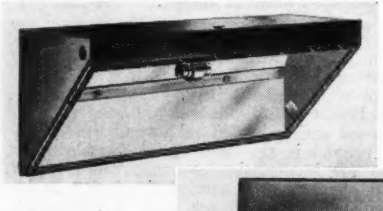


"Temco" reversible connector with switch

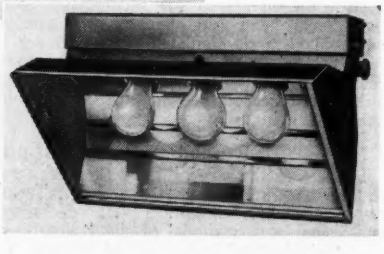
The No. 653 switch incorporated is stated to pass easily the overload and endurance tests required under the other Specification and has, in fact, been tested on a domestic vacuum cleaner to the extent of 18,000 starting and stopping operations without any trouble or failure. While particularly suitable for electric irons the connector is equally useful for a variety of other domestic appliances.

Trough Lighting Units

Two lighting units designed particularly for shop windows, but equally applicable in these days of blackout to interior display work have been recently placed on the market by BROWN BROS., Great Eastern Street, E.C.2.



Two "Duco" display lighting troughs, the one below blending discharge and tungsten lighting



One is a display trough intended for building in. It consists of a heavy-gauge metal case containing a system of scientifically arranged mirrors giving accurate control of light. The overall dimensions are 20 in. by 8 in. by 8 in. and accommodation is provided for two 60-150 W lamps. The standard exterior finish is old gold.

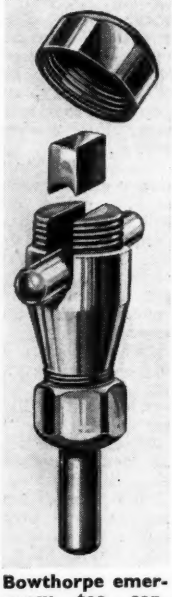
The other unit is the "Duco" blended light trough which is designed to house one 80-W electric-discharge lamp with a tungsten lamp on each side. Two degrees of blended light are possible according to whether 100 or 150-W tungsten lamps are employed. Here again a system of mirrors ensures both accurate mixing of the light and economical distribution.

Heterodyne Reactance Comparator

A new instrument made by SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, Salford, 3, is a heterodyne reactance comparator designed for checking coils used in the manufacture of radio apparatus during the course of production. It is simple in construction and can be used by semi-skilled labour.

Emergency Cable Connectors

A range of cable connectors intended specially for emergency work has been made available by the BOWTHORPE ELECTRIC CO., LTD., Goodtric Works, Purley Way, Croydon. They are strongly constructed and quickly and easily fitted without the use of solder. Six different sizes are made suitable for holding cables from 0.32 to 0.721 in. diameter. In addition, there are three tee connectors taking 0.1 sq. in main conductor and 4 SWG tee, 0.04 sq. in. main conductor and 8 SWG tee, and 0.04 sq. in. main and 4 SWG tee.



Bowthorpe emergency tee connector

A.R.P. Shades

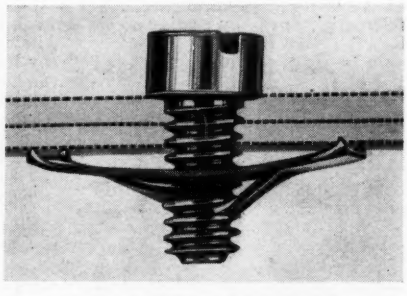
Something rather different in the way of A.R.P. shades has been brought out by METAL COMPONENTS, LTD., Arundel Place, Eastern Road, Brighton. This consists of four metal flaps which close down on the lamp in somewhat the same way as the petals of a snowdrop flower. A small pilot beam of light is emitted from the bottom of the bulb and the leaves of the shade can be operated independently so that part of the room can be screened by three leaves closing over the bulb while one is left open. Similarly, for lighting a passage, two opposite leaves can be opened.

Another type of shield, offered by DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, London, W.C.2, is especially suitable for entrance halls, passages, hospital bed lighting, office desk and typewriter lighting, &c. Its cylindrical design (4 in. diam. by 6 in. long), besides cutting off all side rays at a very steep angle and unlike cone shades having no angular reflection, enables the wattage of the lamp to be reduced considerably. The shield is constructed of 24-gauge steel, finished in grey, and the top, a domed pressing, is welded to the cylinder, there being no solder to melt nor tinning to fuse to the holder ring. A bottom disc with a 1¾-in. hole is available if required. The same company is also making welded steel gas mask containers, finished in grey cellulosed enamel.

Spring Tension Fastening

An ingenious device already employed extensively in the United States for simplifying assembly work and reducing time and cost is now being made in this country by SIMMONDS AEROCESSORIES, LTD., Great West Road, Brentford. This is the Simmonds "Speed Nut" available in a wide range of different types suitable for use in materials and situations of all kinds. Applications in the electrical and radio fields are innumerable.

The nuts, which are made of high carbon spring steel, consist essentially of two slotted tongues facing each other at slightly different angles and, being pressed on to the screw by means of a special tool, are kept in position by tension. Final adjustment is possible by means of a screwdriver in the usual way. Actually, studs without threads can be used instead of screws equally effectively, and once fixed cannot come loose. This "Speed Fix," as it is called, is especially useful for use in moulded materials and does, in fact, make possible assembly work in thin materials which would not stand drilling. If it is desired to have the studs removable a type with a semi-circular cross-section must be used.



A Simmonds "Speed Nut"

Special types of nuts are available for blind location assembly as well as for multiple fastening. A further variation of the idea is the "Speed Clip," also made in a large number of designs, the principle advantage of which is that it eliminates the necessity for grub screws.

COMMERCIAL and INDUSTRIAL NEWS

Wholesalers' Prices. Mobile Generating Set. Wiremen for H.M. Ships. Foundry Lighting Installation.

Order Now

THERE has been an excellent response from readers to the request that they should place a regular order for the ELECTRICAL REVIEW with their newsagents. Those who have not yet done so are asked to place an order now, as in common with other journals there will in future be no surplus copies available for casual purchase from bookstalls or newsagents. For their assistance an order form is printed on page 52 of our advertisement section.

Wholesale Price Decision

After consultation with other trade associations the Council of the Electrical Wholesalers' Federation (whose offices are now at 28, Grey's Road, Henley-on-Thames), has ruled that its members shall not increase prices to cover the present War Risk Insurance, the incidence of which upon turnover is considered too small to warrant any extra charge by wholesalers. Contractors and resellers are recommended not to do business with any wholesaler who seeks to exploit for profit the present abnormal trading conditions.

Mobile Diesel Alternator Set

A new type of mobile generating set has been put on the market by Blackstone & Co., Ltd., and is now being used for providing electricity in case of emergency. The set consists of a 120-BHP Blackstone engine and a 75-kVA alternator on a trailer, and, when generating, the trailer is free from vibration. The smooth running of the engine together with the efficient silencing of both the air intake and the exhaust outlet reduce noise to the minimum. For transport purposes the trailer can easily be coupled to any suitable tractor and hauled at a maximum speed of 20 MPH. The chassis, manufactured by R. A. Lister & Co., Ltd., is made of rolled steel channel with welded cross-members and has high-pressure pneumatic tyres. The trailer is totally enclosed and has ventilators with louvres in the roof and front panel. A large double door at the back gives access to the control end of the engine.

A fabricated-steel base-plate, bolted to the chassis, carries the engine and alternator, which has a belt-driven exciter. The gross weight of the unit is approximately 15 tons. The cables from the alternator terminal box are carried in a solid-drawn conduit to the switchboard. Power to the external load is taken by a trailing cable permanently connected to the load side of the oil circuit breaker on the switchboard. The compressor set comprises a 3-BHP Lister air-cooled petrol engine coupled through reduction gear to a two-stage compressor. The unit is mounted on a raised platform at the front end of the trailer.

Six bulkhead fittings are provided for lighting, the interior lighting system consisting of two circuits—one at 230 V, when the plant is generating, the other from one of two 12-V batteries, which are kept fully charged by a trickle charger. The radiator is mounted on the front platform, and the fan, driven from an extension of the alternator shaft, cools both the circulating water and lubricating oil for the engine. The fuel storage tank is carried in the chassis under the engine bed-plate, the fuel being transferred as required to the service tank, which has a gravity feed to the fuel transfer pump on the control end of the engine.

"Philora" electric-discharge lighting at the foundry of Ashwell & Nesbitt

A Cosmos Calendar

Every autumn, when the office calendar is beginning to lose its freshness, the Cosmos lamp calendar of the Metropolitan-Vickers Electrical Co., Ltd., arrives to provide bright relief for the office walls. The accompanying illustration shows the portrait of the lady who adorns the 1939-40 calendar. This is in warm colours, and each of the daily tear-off slips bears a quotation.

The latest "Cosmos" girl

Wiremen on H.M. Ships

The naval correspondent of *The Times* reports that in time of peace the electrical machines, circuits, and lighting system in H.M. ships are maintained by the Torpedo Branch. In the last war, however, a number of men were entered "during hostilities only" who, being competent for minor electrical maintenance duties, were able to release men for deck and torpedo work. They were rated as "wiremen," and this rating is now to be revived under the same conditions. Wiremen will be entered for "hostilities only." Candidates will be required to pass a trade test, and pay on entry will be 3s. 6d. per day, with a rise to 3s. 10d. after three years. They will be eligible, after six months' service, for promotion by selection to leading wiremen, at 4s. 10d. per day, of whom the establishment will be one in five.

Foundry Lighting

The use of electric-discharge lighting for industrial illumination has considerable economic advantages in its favour, whether under conditions of peace or war. Now that the Government's request for economy in energy consumption must be complied with, these advantages are all the more desirable. A typical example of "Philora" industrial lighting is the installation at the foundry of Ashwell & Nesbitt, consisting of thirty-two 400-W, eleven 250-W and ten 125-W mercury lamps. The lamps are housed in "NR.45" dispersive and "NB.45" concentrating type Philips reflectors for low and high mounting, respectively, this combination of lamps and fittings giving an average intensity of 10-12 ft.-candles. The accompanying picture shows the adequacy of the lighting and its even distribution. The whole of the work was carried out by the Midland Dynamo Co., Ltd., and the lamps, fittings and control gear were supplied by the Nottingham Branch of Philips Lamps, Ltd.

Electrical Equipment for A.R.P.

Belling & Co., Ltd., have issued a special folder showing electric heating and cooking apparatus suitable for use in connection with air raid precautions. The company has already supplied a great many fires, boiling rings, &c., to local authorities throughout the country for the heating of control centres, wardens' posts, A.F.S. posts, and for other emergency purposes. Among the appliances shown in the folder are some which can be used both for heating and for doing small cooking operations at the same time without using any more electricity.

British Institute of Radiology

The first monthly meeting of the British Institute of Radiology will be held on October 19th at the Reid-Knox Hall at 4 p.m., when the president for the 1939-40 session will be installed.

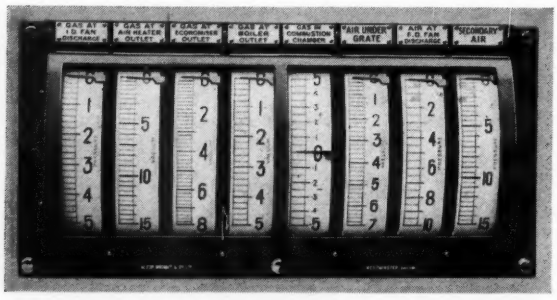
Plumber-Jointers' Wages

The Joint Industrial Council for the Electrical Cable Making Industry announces that the rates of wages of plumber-jointers in the Greater London Area have been altered to 1s. 10½d. per

hour, and those for plumber-jointers' mates to 1s. 6d. per hour. The new rates apply as from the second pay day in October for the period covered by that pay day and remain current up to March, 1941.

Draught Gauges

The accompanying photograph is of the latest type of "Simmance" dead-beat draught gauges which have been supplied by Alexander Wright & Co., Ltd., to a London power


GAS AT I.D. FAN DISCHARGE
GAS AT AIR HEATER OUTLET
GAS AT ECONOMISER OUTLET
GAS AT BOILER OUTLET
GAS IN COMBUSTION CHAMBER
AIR UNDER GRATE
AIR AT F.D. FAN DISCHARGE
SECONDARY AIR

Draught gauges supplied to a London power station

station. These gauges are flush-front mounted at eye-level and are observable through a wide angle. Individual units can be withdrawn from the back. Their effective length is 10 in. with a width of 2½ in. and a ¾ in. marginal clearance.

Women Meter Readers at Manchester

At last week's meeting of the Manchester City Council a proposal from the Electricity Committee that four women should be engaged as meter readers was considered. It was decided that the Committee should be instructed to engage men for the work. A member stated in the discussion that over 150 men had been discharged from the Electricity Department as redundant.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, ETC.	Price October 11th	Fortnight's inc. or dec.
a	Acid oxalic ... ... per cwt.	50s.	—
a	Ammoniac, Sal ... ... per ton	£37	—
a	Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a	Borax ... ... ,,	£17	—
a	Copper, Sulphate ... ... ,,	£19	—
a	Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a	,, Perchlorate ... ... ,,	6d.	—
a	Shellac ... ... per cwt.	£4 8s.	—
a	Sulphur, Commercial ... ... per ton	£11	—
a	,, Roll ... ... ,,	£11	—
a	Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a	,, Crystals ... ... per ton	£5 to £5 5s.	—
a	Sodium, Bichromate, casks ... per lb.	4½d. net	—
	METALS, ETC.		
b	Aluminium, Ingots ... ... per ton	£94	—
b	,, Wire ... ... per lb.	1/1 to 1/9	—
b	,, Sheet and Foil ... ,,	1/2¼ to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£197	—
	Grade II ... ... ,,	£137	—
	Grade III ... ... ,,	£73	—
c	Brass (rolled metal 2" to 12" basis)... per lb.	8½d.	½d. dec.
c	,, Tubes (solid drawn) ... ... ,,	1/0½ to 1/0¾	—
c	,, Wire, basis ... ... ,,	9½d.	½d. dec.
c	Copper Tubes (solid drawn) ... ... ,,	1/1½d.	—
g	,, Bars (best selected) ... ... per ton	£86	£1 dec.
g	,, Sheet ... ... ,,		
g	,, Rod ... ... ,,		
d	,, (Electrolytic) Bars ... ... ,,	£51	£1 dec
d	,, Wire Rods ... ... ,,	£55	£1 10s. dec.
d	,, H.C. Wire ... per lb.	8¼d.	⅛d. dec.
f	Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/3 +10%	—
f	,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8 adv.	—
n	German Silver Wire, Nos. 1 to 12 ... ,,	2/5	—
h	Gutta-percha, fine ... ... ,,	Nom.	—
h	India-rubber, Para-fine ... ... ,,	11d.	—
g	Lead, English Pig ... ... ,,	£18 10s.	—
g	Mercury ... ... per bot.	Nom.	—
e	Mica (in original cases) small ... per lb.	1/3 to 3/–	—
e	,, ,, ,, medium ... ,,	9/– to 18/–	—
e	,, ,, ,, large ... ,,	20/– to 27/6	—
p	Phosphor Bronze, plain castings ... ,,	1/2¾	—
p	,, ,, drawn bars & rods ,,	1/2	¼d. inc.
p	,, ,, rolled strip & sheet ,,	1/–	¼d. dec.
p	,, ,, wire ... ... ,,	1/2	¼d. dec.
o	Platinum ... ... per oz.	£10	—
d	Silicium Bronze Wire ... ... per lb.	8¾d.	—
g	Spelter ... ... per ton	£15	—
g	Tin, Block (English) ... ... ,,	£230	—
n	,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	6d. inc.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

Mica Control

Under the Control of Mica (No. 1) Order dated October 3rd made by the Minister of Supply, those carrying on any undertaking which involves the treatment, storage, distribution, disposal, acquisition, use or consumption of mica or goods of which mica is a constituent part, or any article or material required in connection with the treatment or use of mica, may be required by individual notice or general direction to furnish returns and other information relating to that undertaking.

Temporary Removals

Philips Lamps, Ltd., announce that the sale and order departments are now at Century House, Shaftesbury Avenue, London, W.C.2 (telephone: Gerrard 7777), and the accounts and administrative departments at "Bonaly," Beadles Lane, Oxted, Surrey (telephone: Oxted 513).

Watsham's, Ltd., have removed to "Cliffdene," Church Road, Caversham, Reading (telephone: Reading 71748).

Mr. J. Bruce and staff, consulting engineers, have moved to 40-41, Worcester Place, Swansea (tel.: Swansea 3527). Mr. Bruce's temporary private residence is Glyn-y-Coed, 110, Newton Road, Mumbles, Swansea.

Trade Announcements

The Brush Electrical Engineering Co., Ltd., has effected an arrangement to take over the patents, manufacture and sale of the "Koela" gas producer, which will in future be marketed under the name of "Brush-Koela." This type of producer can be applied for the driving of all types of internal combustion engines, and has been specially developed for the use of all classes of motor vehicles. Distributors and dealers are being appointed throughout the country. Mr. B. Monck, chairman of the Koela Producer Gas Co., has joined the Brush Co., and will have charge of this side of the business.

The head office of the Reliance Telephone Co., Ltd., has been removed to 39-41, Parker Street, London, W.C.2 (telephone: Chancery 5341-5). The company states that it is in a position to supply at short notice telephone and signalling systems for A.R.P. purposes in works and offices, and automatic exchanges, loudspeaking telephone systems, &c., either on purchase or rental basis.

The London Electric Wire Co., & Smiths, Ltd., informs us that the company and its associated company, the Liverpool Electric Cable Co., Ltd., are not expecting to make any change of quarters, the head office being 24, Queen Anne's Gate, London, S.W.1, and the city office, 7, Fortune Street, E.C.1.

One Horse Power

The rationing of petrol presents new difficulties to concerns whose service covers a wide area. The Reading branch of the Hotpoint Electric Appliance Co., Ltd., however, does not appear to be unduly perturbed by the new regulations. Our

The Hotpoint Reading branch has found the horse an excellent substitute in these days of rationed petrol

picture shows one of the company's electric washing and wringing machines mounted on a horse-drawn vehicle which, although taking a little longer in delivery, ensures that the company's service is maintained. An electric vehicle would also, of course, have proved an excellent alternative to the petrol-driven van.

Rubber Company's Jubilee

To celebrate its golden jubilee, the Reliance Rubber Co., Ltd., has issued an interesting booklet entitled "Plastic Gold," giving the story of rubber in the service of mankind. It is illustrated by woodcuts.

Factory Lighting

The London Section of the Institution of Rubber Industry has received an invitation from E.L.M.A. to a lecture-demonstration at the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, on October 9th, at 5 p.m., when Mr. L.

Harrison will deal with the lighting clauses of the Factory Act and the lighting requirements of the Civil Defence Act. Dr. H. A. Daynes (chairman of the London Section of the Institution) will occupy the chair.

No Rationing for Electric Vehicles

The Electric Vehicle Association of Great Britain, Ltd., informs us it is now understood that the intrepretation put by the Mines Department upon the Fuel and Lighting Order as regards the use of electricity for electric battery vehicles is that the electricity is not used on the premises where the vehicles are charged, but merely stored by the batteries on those premises, and is actually used on the streets. It therefore follows that electric battery vehicles do not come within the scope of the Order and they are thus not subject to rationing. Users are therefore at liberty to use as much electricity for charging their vehicle batteries as their business may require, and to add additional vehicles to their fleet. In view of this interpretation there will be no necessity to approach the Local Fuel Overseer with a request to increase the basic quantity, but it might be as well to notify him of the proportion of the basic ration which is used for electric vehicles, as this would avoid any possible difficulties at the end of the period, when it is found that the basic quantity has not been cut down by 25 per cent.

Birmingham Electric Club

The Birmingham Electric Club is holding a luncheon at the Grand Hotel, Birmingham, on October 20th, when Mr. J. Hamilton, the president, will occupy the chair. Tickets (3s. 6d. each) can be obtained from Mr. A. T. Haywood, hon. social secretary, 24, Tamworth Road, Sutton Coldfield.

Revo Prices

We are informed by the Revo Electric Co., Ltd., that the prices of domestic appliances shown in booklet H.27 have been increased by 7½ per cent., and that the prices of switch and fusegear (catalogue S.15), fans (catalogue F.17) and some of its electric lighting fittings shown in catalogue No. 16, have been advanced by 10 per cent. The prices of electric cookers, industrial reflectors, certain lighting fittings and illuminated street guard posts are unaltered.

Special Domestic Issue

In connection with the list of manufacturers' names and addresses on page 470 of last week's issue of the ELECTRICAL REVIEW, Londex, Ltd., points out that it has now moved to Anerley Works, 207, Anerley Road, London, S.E.20.

Prices of Decorative Fittings

At a meeting of the ornamental and decorative fittings manufacturers (Electric Light Fittings Association) last week, it was decided that due to increased costs, particularly that of 15 per cent. on glassware, all fittings which were previously priced with British glassware are advanced by a maximum of 10 per cent., and on such spare glassware by a maximum of 15 per cent. Where British glassware is substituted for foreign glassware such fittings will be requoted for specially on the basis of the present cost of British glassware.

New Catalogues and Lists

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—Details relating to various A.R.P. equipment including transformers for low-voltage lighting, emergency announcement loudspeaker sets, lamp screens, adjustable table and floor lamps, air distributors, fan heaters, &c.

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—A folder relating to special lamps for A.R.P. purposes.

Dalo, Ltd., 47, Victoria Street, London, S.W.1.—A leaflet outlining the "Dalo" method of blacking out factories which admits daylight but prevents the emission of artificial light.

T. B. Morley & Co., Ltd., Jameson Street, Hull.—A 60-page catalogue (No. 104) describing and illustrating, mostly in colour, the company's wide range of "Morco" domestic lighting fittings.

Cressall Manufacturing Co., Ltd., 31-32, Tower Street, Birmingham.—Leaflet No. 78 describing steel jacketed unit heaters for use in such places as railway carriages, tobacco kiosk, showcases, drying tables, machinery, &c.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Leaflet O.V.7644 dealing with type "A373" "Osram" valve, a small diode suitable for high frequency peak voltmeters.

George H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester.—A leaflet describing the single- and double-pole "Wylex" AC switch. This switch was originally introduced in the "Wylexion" sockets and "Wylex" (flat-pin) sockets, but is now produced as a separate unit.

Martindale Electric Co., Ltd., Westmorland Road, London, N.W.9.—A leaflet dealing with the company's "Super-Blowers," which now include the new "Blower-Clean," a small apparatus particularly suitable for blowing out instruments and switchboards where the standard models would be too powerful.

Brook Motors, Ltd., Empress Works, Huddersfield.—A brochure drawing attention to 70 points contributing towards the reliability and efficiency of a modern Brook electric motor.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

DIAMOND torch batteries.

AMPREX valves.

Parliamentary News

By Our Special Reporter

Rationing and Fixed Charges

IN the House of Commons, on October 4th, Sir Stanley Reed asked the Minister of Transport whether, in view of the restriction of private consumers of electricity to 75 per cent. of their normal consumption, he would consider taking powers by regulation or legislation, to ensure that where two-part tariffs were employed the base charge should be reduced to 75 per cent. of the standing figure.

Captain Wallace said that the base charge under an ordinary two-part tariff was a service charge to cover those costs which did not vary with the amount of electricity consumed. An automatic adjustment such as that suggested would, therefore, not be appropriate.

Displaced Electricity Supply Men

On October 5th Mr. Thorne asked the Minister of Labour whether he was aware that electricity undertakings were increasingly discharging both fully skilled and semi-skilled men, particularly those engaged on the distribution side; whether the loss of these key men from the industry was being taken into consideration; and what did he propose to do about it.

Mr. E. Brown said he was not aware of any general tendency of this nature, but he would be very glad to inquire into any instances which the hon. member might like to bring to his notice. Every effort would be made to find alternative employment for men who were being displaced.

Central Register

The Minister of Labour, stated on October 5th, that the total number of persons possessing scientific, technical, professional, or higher administrative qualifications at present enrolled on the Central Register was over 95,000. Large numbers of these were already engaged on work of national importance. Up to the end of September orders for 4,695 vacancies had been received, of which the great majority were made by Government Departments. For these orders, 3,479 names had been submitted to the Department or employer. Information was not yet available as to the numbers engaged.

Excess Profits Tax

On the Committee stage of the Finance Bill (No. 2) the Chancellor of the Exchequer explained the provisions of the clauses imposing an Excess Profits Tax. He said that the tax could not be applied to individual incomes for a number of reasons. The tax would follow closely the system devised for the Armament Profits Duty and the datum line would be the same as was employed for that duty.

Long-established concerns and newer ones would be considered separately. In the ordinary case of the former class the taxpayer would have the option of being assessed on the profits for the calendar years 1935 or 1936, or for the average of the two years 1935-36 or 1936-37. If additional capital had since been introduced an upward adjustment would have to be made. In the case of businesses formed subsequently to July 1st, 1936, the standard profits would be taken as a percentage of the capital employed in the business.

The Chancellor claimed that the scheme was a better one than that employed for the Excess Profits Duty during the last war. As before there was provision for relief in the case of a deficiency. Parent and subsidiary companies would be considered as one unit for the purposes of the tax. Clause 19 provided that the new tax should be an alternative to the National Defence Contribution, the higher amount being paid.

Allowance would be made for exceptional depreciation of buildings, plant and machinery installed for purposes arising out of the war which might not be required for other purposes.

ELECTRICITY SUPPLY

Criticism of Electricity Rationing at Grimsby. Lighting Restrictions Discussed in Glasgow and Belfast

Barking.—CONDITIONS OF SUPPLY.—The Electricity Committee recommends that consumers should not be allowed to change from quarterly to prepayment meters in order to evade the Fuel Order. It is also proposed that no more hire-purchase work should be done, and that orders in hand for cookers, &c., should not be proceeded with. An agreement with the gas company under which it would not displace any electrical apparatus if the Electricity Committee agrees not to displace any gas apparatus is contemplated. Where gas and electrical facilities exist together, the incoming consumer would be offered the choice. It is proposed to "declare a moratorium" on all hired apparatus as the apparatus is disconnected; all apparatus would be left on the premises unless the consumer desired it to be removed.

Bath.—SUSPENSION OF HIRE AND HIRE-PURCHASE.—Whether hire and hire-purchase trading by the Electricity Department should be suspended was discussed by the City Council last week, when a recommendation to this effect was made by the Electricity Committee. Mr. W. Barrett thought that the Committee's action would cause considerable hardship. Alderman S. Day, moving that the recommendation should be referred back, said that if the gas company could find a way out surely they could. The amendment was defeated by twelve votes to nine.

Belfast.—MODIFICATION OF BLACK-OUT?—Criticism of the black-out was voiced by the deputy Lord Mayor at a recent meeting of the City Council. He said that he had received protest after protest from citizens. In reply, Councillor P. Brown, chairman of the A.R.P. Committee, said that it was a matter for the Ministry of Home Affairs which, he understood, was considering a modification of the scheme.

Derby.—COUNCIL TO CONSULT COMMISSIONERS.—The Electricity Commissioners are to be consulted by the Town Council regarding proposed extension schemes estimated to cost nearly £600,000. Various proposals, including £163,644 for development on housing estates, are being deferred.

Doncaster.—SYSTEM INTERCONNECTION.—The Town Council has approved proposals for enabling the Yorkshire Electric Power Co. and the Corporation to provide mutual assistance by interconnecting the mains of the undertakings at two points. The work will be put in hand immediately the consent of the Electricity Commissioners is received.

HIGH-VOLTAGE EXTENSIONS.—A scheme costing £8,770 for extending the 11-kV system in the centre of the town is to be submitted to the Electricity Commissioners. It is proposed that the cost should be defrayed out of the reserve fund.

Dundee.—PAYMENTS ALLEGED TO BE ILLEGAL.—The granting of *ex gratia* payments by the Corporation to tenants of municipal houses who installed electricity at their own expense is considered by Mr. S. Milne, auditor of the Corporation's accounts, to be illegal. Other decisions by the Council which he contends are illegal relate to the reduction of municipal house rents by 10 per cent., the provision of free passes to councillors for use on the Corporation trams and buses, and the granting of allowances to councillors for telephone installations and calls.

Glasgow.—STEP TO SECURE MODIFIED LIGHTING.—It was decided last week by six votes to five to send a deputation to interview M.P.s and the Home Secretary in support of a modification of lighting restrictions for streets, trams and buses. The Lord Provost, who moved that no deputation should be sent, said he was opposed to any general relaxation because it would endanger the whole community and also add to the risks undertaken by those responsible for the defence of the city. It is understood that the Members of Parliament for the city have expressed similar views.

Grimsby.—CRITICISM OF RATIONING.—At the October meeting of the Electricity Committee it was suggested that the rationing of electricity was unnecessary as the black-out regulations, the early-closing of shops and the reduction of street lighting would effect a saving in the consumption of fuel without further harassing domestic consumers by forcing them to reduce their electricity consumption.

Hove.—LOAN FOR CHANGE-OVER.—The Electricity Commissioners are being asked to endorse their sanction to a loan of £31,550 for the change-over in the south-eastern area. About £24,000 of the amount has already been spent.

Hull.—REDUCED ELECTRICITY CONSUMPTION.—Figures showing the effect of the war on electricity consumption were given by the general manager of the Electricity Department (Mr. D. Bellamy) at a meeting of the Electricity Committee last week. He said that as a result of the war there was a reduction of 20 per cent. in the output of the undertaking, equivalent to £180,000 per annum. During the winter the proportionate fall would increase due to lighting restrictions, the earlier closing of shops, and rationing. Restriction of the fishing industry had seriously affected the demand for electricity and the fall might be something like 15,000,000 to 20,000,000 kWh a year. It was not possible to indicate at present whether there would be a set-off against this reduction by increased demands from other industries.

HIRE POLICY.—The Electricity Committee reports that assisted wiring has been restricted to existing consumers who have electrical apparatus and who transfer to another house where no installation exists. Hire-purchase is confined to existing stocks or to the manufacturers' own hire-purchase finance and, in the case of electric fires, the repayment period is restricted to one year. Hiring schemes which include cookers and water heaters are regarded as essential and are being continued as usual. It is thought that new stocks will not be required for a considerable time as the large amount of apparatus recovered from evacuations and cancellations will meet the demand, which is still fairly high. All apparatus recovered is completely re-conditioned and re-issued. In the case of cancellations, the apparatus is left on the premises until required if the house remains furnished or tenanted and the rental ceases. In this way the apparatus is available for use on the return of the consumer or may be recovered for issue elsewhere, and no large accumulations of stock are created at any depôt.

Leeds.—CONTROL OF ELECTRIC LIGHTING.—The Lighting Committee is to alter the method of controlling electric street lighting in the city at a cost of £1,557.

Lichfield.—PROPOSED SUB-STATIONS.—The Electricity Committee has purchased sub-station sites at Fradley and Orgreave.

Liverpool.—SUSPENSION OF HIRE PURCHASE.—The Electric Supply Committee has decided to suspend all hire-purchase facilities and the assisted wiring scheme. The city electrical engineer is also authorised to withdraw the hire of certain types of apparatus at his discretion.

LOANS.—Permission has been obtained to borrow up to £50,000 for new mains and services, and up to £20,775 for the provision of 15 sets of rectifier equipment.

London.—ALTERED AGREEMENTS.—The Metropolitan Electric Supply Co., Ltd., has notified its "all-in" tariff consumers that it proposes to terminate their agreements at the end of the year and invites them to sign a new agreement under which the charges can be altered by three months' notice in writing. Those who do not sign will be charged at the flat rates after December 31st.

Macclesfield.—PURCHASE PRICE OF UNDERTAKING.—The Electricity Committee recommends the Town Council to agree that the price to be paid for the 1911 electricity undertaking (the old borough) should be £390,000. Together with the price for the outside areas already agreed (£270,000) the total amount payable to Electricity Company of Macclesfield, Ltd., will be £660,000.

Manchester.—RING MAIN TO BE COMPLETED.—The City Council has approved a scheme for extensions of mains and transmission lines, including a 33-kV feeder from Stuart Street power station to Droylsden East sub-station at an estimated cost of £16,000. This will complete one of the ring systems, and, therefore, be of general value if other feeders should be put out of action. It is proposed that a 0.3 sq. in. 17,000 kVA cable should be laid.

INSTALLATIONS IN COUNCIL HOUSES.—Towards the cost of wiring a number of houses owned by the Corporation, the rents have been increased by 1½d. per week.

DISTRIBUTION WORK.—The Electricity Committee has authorised the chief engineer and manager to institute a short-time system of employment for certain workmen, and to accelerate the replacement of overhead networks on the Blackley and Gorton Mount estates. The cost of the work will be met out of the reserve fund.

Nelson.—BULK SUPPLY TO BARNOLDSWICK.—Representatives of the Corporation have interviewed officers of the Electricity Commission with reference to the inquiry regarding the bulk supply of electricity to Barnoldswick. The sub-committee which has been dealing with the matter has now decided to inform the Barnoldswick U.D.C. that the Corporation is prepared to continue the bulk supply, without prejudice, in accordance with Section 12 of the 1926 Act.

Rotherham.—HIRED LIGHTING FITTINGS.—The Electricity Department has hired out lamps and time switches for late shop-window lighting, &c., which, due to lighting restrictions, cannot be used. Last week the electrical engineer, reporting on the matter, pointed out that the capital on such apparatus had been spent by the Corporation, and if the hirer continued payment he would not be in a worse position than the trader who had purchased his own equipment. The Electricity Committee, however, recommended that, subject to the hirers agreeing, payment at the full rates for outside lamps, &c. (with or without electricity), should be suspended until further notice, and that during such suspension one-third of the normal charge should be made. The period of suspension will not be reckoned as part of the minimum agreement period.

Scarborough.—ALTERED TARIFF CONDITIONS.—The Town Council has authorised the following modifications of the conditions relating to electricity charges: Subject to consumers having completed the minimum period of twelve months, agreements made under Scales A (domestic), B (business), and C (power) of the all-in tariff may be terminated as from the end of the quarter in which notice is given instead of the usual three months' notice. Consumers at present charged on Scale B may continue under the existing terms, but no new agreements will be entered into on this tariff. The minimum consumption of 1,000 kWh per annum is reduced to 500 kWh for users of electric cookers and water-heaters under Scale A. The minimum consumption of 1,000 kWh per annum for water heating and space heating at the flat rate is suspended.

REPORT ON REORGANISATION.—The Electricity Committee has decided to take no further action for the present regarding a report by the borough electrical engineer on the reorganisation of the electricity undertaking.

Sunderland.—TARIFF CHANGES.—Owing to lighting restrictions due to the war the Town Council has decided to suspend the advertising lighting tariff. In addition electricity used for shop window lighting is to be charged at the ordinary lighting rate of 3d. per kWh.

Swansea.—TRANSFER OF POWER PLANT.—It was reported at a recent meeting of the Electricity Committee that the removal of the 12,500-kW turbo-generator from the Strand power station to the Tir John station would be an economic proposition. Mr. H. E. Blackiston, the electrical engineer and manager, stated that it was a most reliable set and had ten years' service. It was agreed to place the matter before the Central Electricity Board.

Torquay.—PLEA FOR REVISION OF STANDING CHARGES.—A number of letters have recently been received by the Electricity Department from consumers urging that, in view of the lighting restrictions, there should be a revision of the two-part tariff standing charges. Last week it was reported to the Town Council that, in view of the complicated and abnormal circumstances, the Electricity Committee was unable to deal with the matter at the moment, but would give it consideration as early as possible when the effect of war conditions upon the working of the undertaking was known.

Wigan.—POWER PLANT AT HOSPITAL.—The Public Assistance Committee proposes to install a generator at the Billinge Hospital at a cost of £927.

Worthing.—APPLICATIONS FOR HIRED APPARATUS.—So many applications have been received by the Electricity Department for hired apparatus required by newcomers to the town that steps have been taken to make sure that there is no financial loss. Applicants are being asked to make their own arrangements for circuit wiring.

TRACTION

London.—FLOODGATES TO PROTECT UNDERGROUND RAILWAYS.—Last week representatives of the Press were invited to inspect some of the protective works which the London Passenger Transport Board is carrying out on the underground railway. Steel floodgates have already been installed at Waterloo and Charing Cross on the Bakerloo Line, and by the end of the year it is expected that similar works will be completed on the Northern Line between Waterloo and Strand. The total cost of the protective works being undertaken by the Board for its various services is approximately £1,000,000.

Safeguarding the underground system against the danger of flooding from the Thames and from sewers and water mains through damage during air raids is the most difficult wartime problem that the Board has had to face. Last year, at the time of the crisis, the sections below the river were walled up with concrete, and since then permanent floodgates have been installed on the Bakerloo Line. For the section of the Northern Line between London Bridge and Moorgate several protective schemes have been under consideration, and the Board is now awaiting the decision of the Ministry of Transport on whether it should install floodgates.

The gate at Waterloo Station, which was shown in action last week, is 13 in. thick and weighs nearly 6 tons. It slides horizontally into position in a frame of cast-iron across the mouth of the tunnel, being operated either electrically or by hand. When closed it is stated to be capable of resisting a pressure of 800 tons.

When an air-raid warning reaches the office of the traffic controller the signal "Close the doors" is sent to the operators and is acknowledged electrically from the operators' control cabins, in which there are illuminated diagrams showing whether the under-river sections of line are clear of trains or not. Interlocking gear makes it impossible to close the gates with a train between them. Before a gate can be closed the small gaps between the gate-sill and the rails are filled with shaped metal blocks, lined with rubber, so making a continuous runway for the gate.

RAILWAY ACCIDENT REPORT.—The report of Col. A. C. Trench into the circumstances of the collision at Farringdon station on May 1st last, when a number of passengers suffered from injuries, has been issued. A three-car electric train on the former Metropolitan Circle line of the L.P.T.B. system came into glancing head-on collision with a G.W.R. steam locomotive and brake van which were crossing over from one line to another. The cause of the accident was the starting of the electric train from the station against a signal at "danger." The speed of the train prevented it from being stopped in time by the automatic trip or the motorman's emergency brake application, which probably synchronised. The inspector's conclusion is that primary responsibility must be borne by the motorman, shared in a lesser degree by the guard and a platform porter, for not making certain that the starting signal was in the "off" position. It is possible that the motorman, while his attention was directed towards starting his windscreen wiper, mistook the guard's bell for another type of bell which would have indicated that the starting signal was "off." The report suggests that the L.P.T.B. should consider means of avoiding a repetition of the occurrence.

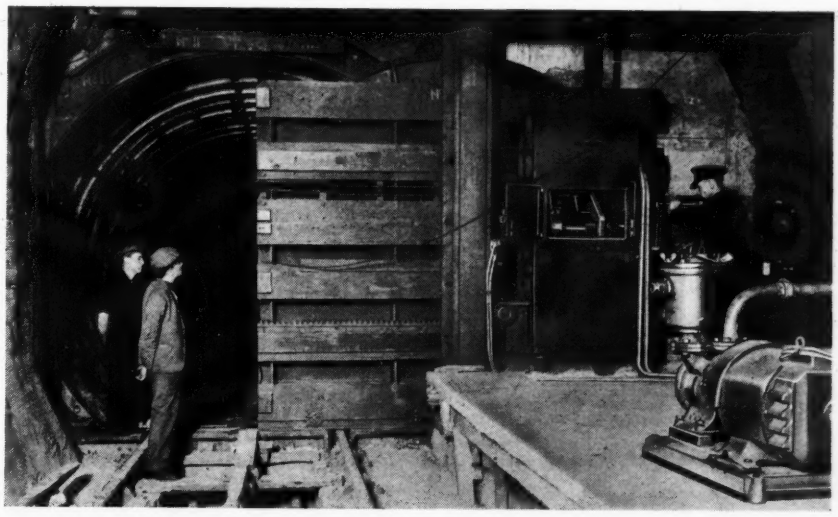
Northern Ireland.—TROLLEY-BUS SYSTEM TO BE EXTENDED.—The Belfast Corporation has decided to proceed with the extension of the trolley-bus system to the east end of the city. Motor-buses are being maintained only on roads not served by the trams.

COMMUNICATIONS

Great Britain.—RADIO RELAY SYSTEMS?—The Cheltenham Highways Committee has now agreed to consider applications for the installation of broadcast relay services. At Eastbourne the Corporation General Purposes Committee has had an application from Southall Radio Relay Service, Ltd., for permission to operate a relay, but has adhered to its previous decision not to allow such a service in the town. Chesterfield Corporation Highways Committee has had reports from other towns regarding radio relay services, but has again adjourned consideration of the matter. Blackburn Town Council on October 5th rejected applications for the use of tram standards to carry radio relay wires.

India.—BROADCASTING LICENCES.—According to *The Times*, the number of broadcasting licences in India is approaching 100,000. Revenue increased by nearly two-thirds in the second quarter of this year. There has been an expansion of special wartime services by All-India Radio.

South Africa.—TELEPHONE CONSTRUCTION.—Work is in progress on the modernisation of the telephone service in South Africa, states *Foreign Communication News*. In the near future the city of Johannesburg will be connected with the principal towns of the Cape Province and also with Port Elizabeth by high-capacity lines passing through Kroonstad, Bloemfontein, and De Ar. The Johannesburg-Cape Province line will enable a dozen communications to be made together, as well as the simultaneous transmission of telegraphic messages.



Entrance of "Underground" tunnel showing a mechanic hand-operating the floodgate

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

T. P. Pollitt (Grimsby), Ltd.—Private company. Registered October 3rd. Capital, £2,000. Objects: To acquire the business of an electrical and mechanical engineer carried on by T. P. Pollitt at Grimsby. Subscribers: J. T. Roberts, 240, Laceby Road, Grimsby; and M. K. Wade, 25, Torrington Street, Grimsby. Secretary: J. T. Roberts.

Luminous Signals & Accessories, Ltd.—Private company. Registered October 3rd. Capital, £100. Objects: To carry on the business of sign makers and writers, poster makers, advertising specialists, sign fixers, cleaners and repairers, sign contractors, billposters, electrical engineers and contractors, &c. Subscribers: C. Edmondson, 77, Trinity Court, Gray's Inn Road, W.C.1, and F. S. Skirrow, "Hillcrest," Clayton Road, Bradford. Secretary: F. S Skirrow. Registered office: 77, Trinity Court, Gray's Inn Road, W.C.1.

Lincon Batteries, Ltd.—Private company. Registered October 7th. Capital, £1,500. Objects: To acquire the business of a manufacturer of electric accumulators carried on by G. H. Negus, trading as the Automobile Manufacturing Co. at Royston Avenue, Prittlewell, Essex. G. H. Negus, "Trimsaran," London Road, Leigh-on-Sea, is the first director.

Companies' Returns

Statements of Capital

Electro-Rentals, Ltd.—Capital, £15,000 in £1 shares. Return dated June 5th. 13,100 shares taken up. £13,100 paid. Mortgages and charges, nil.

Enfield Conduits Co., Ltd.—Capital, £1,000 in £1 shares. Return dated June 24th. 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Buckrose Light and Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated July 10th. 180,000 shares taken up. £180,000 paid. Mortgages and charges, nil.

Capital Increase

Pirelli-General Cable Works, Ltd.—The nominal capital has been increased by the addition of £500,000 beyond the registered capital of £500,000. The additional capital is divided into 50,000 "A" and 50,000 "B" shares of £5. To October 6th, 1938, 100,000 shares of £5 had been issued and fully paid up, of which the General Electric Co., Ltd., held 49,996 shares; Pirelli, Ltd., 24,996 shares; and Pirelli Holding S.A., of Basle, 25,000 shares. The new shares were allotted for cash on September 28th, 1939, between the said three companies, *viz.*, 50,000, 25,000, and 25,000 shares, respectively.

Mortgages and Charges

Fleet Electrics, Ltd.—Particulars filed of £2,000 debentures authorised September 9th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

G. K. Jensen & Co., Ltd.—Charge on the company's undertaking and property, present and future, including uncalled capital, dated September 21st, 1939, to secure all moneys due or to become due from the company to National Provincial Bank, Ltd.

Bolton Electrical Traders, Ltd.—Satisfaction in full on July 24th, 1939, of debenture dated January 11th, 1937, and registered January 16th, 1937. (Notice filed October 4th, 1939.) (According to the register of mortgages, the debenture registered January 16th, 1937, originally secured all moneys due or to become due.)

Receivers Appointed and Released

Sun-Lite Lamp Co., Ltd.—A. Caulett, incorporated accountant, of 5, Lower Temple Street, Birmingham, was appointed receiver on September 21st, 1939, under powers contained in debentures dated March 17th, 1939.

Battery Supplies (Electrics), Ltd.—J. Ridehalgh, accountant, of 15, Canterbury Street, Blackburn, was appointed receiver on September 21st, 1939, under powers contained in debenture dated May 15th, 1939.

Barratt & Co. (Blackburn), Ltd.—R. C. Baldwin, of 20, Fox Street, Preston, ceased to act as receiver and/or manager on September 29th, 1939.

Bankruptcy Proceedings

L. W. Meredith, electrical engineer, Lenton Lodge, Derby Avenue, Skegness, lately carrying on business at Prince George Street and High Street, Skegness.—Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver, released October 2nd.

J. W. Harrison, wireless engineer, 29, Midland Street, Hull.—Trustee, Mr. J. E. D. Stickney, 1, Parliament Street, Hull, Official Receiver, released October 2nd.

E. A. Cartwright, radio dealer, 8, Heskey Street, Nottingham, lately carrying on business at 71, Melton Road, West Bridgford.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released October 3rd.

J. Laycock (Laycock & Ridding), electrician, "Lochend," Elam Wood Road, Riddlesden, Keighley, Yorks.—Last day for receiving proofs for dividend October 21st. Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver.

W. G. Baker (Baker & Co.), radio dealer, 19A, Angel Hill, Bury St. Edmund's.—Last day for receiving proofs for dividend October 21st. Trustee, Mr. K. E. Fisk, 13A, Great Colman Street, Ipswich, Official Receiver.

S. C. Green, lately wireless appliance dealer, 215, The Broadway, Southall, Middx.—Public examination November 24th at The Town Hall, Windsor.

W. A. Hammond, wireless dealer, 31, Middle Street South, Great Driffield, Yorks.—Application for discharge to be heard November 15th at the Guildhall, Hull.

J. T. Townson, radio and electrical engineer, 97, Market Street, Dalton-in-Furness.—Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, released September 29th, 1939.

A. Burnham, electrical engineer (Briardale Radio Services), 121, Oak Lane, Bradford.—Last day for receiving proofs for dividend October 18th. Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver.

C. T. Hicks, electrical engineer and contractor, 81, High Street, Witney, Oxford.—Last day for receiving proofs for dividend October 17th. Trustee, Mr. J. B. Simmons, 8, Forbury, Reading, Official Receiver.

W. H. McMillan, radio dealer, 21, Allport Lane, Bromborough.—First and final dividend of 1s. 6d. in the £, payable October 13th at 5, Rumford Place, Liverpool, 3.

Reports and Dividends

The London Passenger Transport Board announces that, notwithstanding an increase in the passenger takings, the financial results for the year to June 30th do not warrant a final payment of interest on the "C" stock; an interim payment of 1½ per cent. was made in March. Not only were the Board's expenses higher during the year, but when at the end of the financial year the final account of the pooling scheme between the Board and the main line railway companies became available, it was found that owing to a general increase in expenses the amount due to the board under the pooling scheme was less than had been anticipated. Appropriations to reserves have been made on the same basis as in the previous two years, but owing to further capital assets being brought into operation during the year an additional sum of £145,000 has been placed to the reserve for renewal. During the year the Board took steps, in conjunction with the main line railway companies, to secure a revision of fares in the London Passenger Transport Area. This revision could not become operative until June 11th, and no material benefit was secured during the financial year. For the period from June 11th to September 1st, when the Government took control of the Board's undertaking, the increased receipts from the revised fares fully realised the Board's estimates. Negotiations are proceeding with the Government with regard to the financial terms covering the period of control, but no settlement has yet been reached.

Strand Electric Holdings, Ltd., reports that the earnings of the subsidiary undertakings for the year ended April 30th were £6,624, as compared with £14,631 for the preceding year, and that the profits of the parent company for the year to July 11th were £978 (against £8,273). An interim dividend of 4 per cent. was paid by the holding company in March last, but no further distribution is recommended. The total distribution for 1937-38 was 10 per cent. The report states that the reduction in profit is mainly the result of non-recurring additional expenditure and increased overhead expenses, in pursuance of a policy of extending the interests of the company. The sharp fall in turnover, notably in connection with cinemas, had an adverse effect upon trading, but new business of an important character has recently been obtained.

Engineering & Lighting Equipment Co., Ltd.—The statutory meeting was held on October 9th, when Mr. S. A. Marples (chairman), who presided, said that, in addition to the urgent existing demands, they had been coping with preparations for increased output concurrently with A.R.P. organisation, black-out, and camouflage requirements. Although lighting business might be said to be under a cloud at the moment, the company had received orders for street lighting in some of the Dominions, and they were ready for a post-war boom in that department. The staff had already been increased by 20 per cent. since the outbreak of war, and the works were being developed so that their turnover of normal times could be increased during the months remaining of the present financial year.

Murex, Ltd., reports a net profit for the year ended June 30th of £337,329, as compared with £422,222 for 1937-38. A sum of £108,500 is set aside for tax, and, as we have already reported, the total distribution is maintained at 20 per cent., including 2½ per cent. bonus. The final 10 per cent. dividend and 2½ per cent. bonus are both less tax at 7s. Obsolescence reserve receives £50,000 and general reserve £40,000, the balance carried forward being £90,167 (against £90,464 brought in).

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend on the ordinary stock of 4 per cent. (actual), free of tax (same).

The Brush Electrical Engineering Co., Ltd., announces that the dividend on the 5½ per cent. cumulative preference stock for the six months to September 30th is being deferred.

Babcock & Wilcox, Ltd., have announced an interim dividend of 4 per cent., less tax (unchanged).

Rawlplug, Ltd., is maintaining its interim dividend at 10 per cent., less tax.

John Thompson Engineering Co., Ltd., is paying an interim dividend of 5 per cent. (same).

The Oriental Telephone & Electric Co. has declared an interim dividend of 4 per cent., tax free (same).

STOCKS AND SHARES

Tuesday Evening.

BY slow degrees, business is creeping back into the Stock Exchange markets. The investor, awaiting Government intentions as to borrowing, is playing a cautious hand. What is vaguely called institutional buying appears only by fits and starts. The whole of the markets continue to be held up, to some extent, by the retention of minimum prices of British Government securities, though each day contributes a little more power towards the de-freezing of the position as this obtains in the cases of the War Loan and two or three other of the largest British issues.

Discrimination applied to industrial shares has brought about a demand for Vickers, Associated Electrical, English Electric and a few others in the manufacturing group. Dividends and reports which are now making their appearance present irregular results; some good, some poor. Strand Electric Holdings, for instance, has decided not to pay a final dividend, leaving the distribution for the year at 4 per cent. as against 10 per cent. a year ago. For some such result the recent heavy fall in the price of the shares has probably prepared shareholders. General Electric ordinary and Tube Investments have been bought by people who require good permanent investments.

English Electrics, at 28s. 9d., are 2s. 6d. to the good. Vickers have risen 1s. to 15s. 9d., Tube Investments $\frac{3}{4}$ to 77s. 6d., and Murex $\frac{1}{6}$ to 76s. 3d. On the other hand, the falls include Lucas, to 45s., Johnson & Phillips, 35s., Lancashire Dynamo, 55s., and Siemens, 18s. 9d. Cable and Wireless stocks are better. Anglo-American Telegraph deferred has gone back to 18¼.

Electricity Supply

Amongst the ordinary shares of the Home electricity companies the tendency is still towards lower prices. This is more particularly noticeable in the cases of provincial undertakings. Electric Distribution of Yorkshire, Lancashire Light and Power and Llanellys are lower, but on the other hand Yorkshire Electrics improved to 30s. and Midland Counties to 30s. 9d. London Electrics are flat at 22s. 6d. British Light and Power gave way to a guinea, at which, on the company's record of earning power, the speculative investor may be tempted to think the shares are reasonably priced.

Gilt-edged Stocks

Without assistance from any reduction in Bank Rate, some gilt-edged securities show signs of floating off the fixed minimum prices on which they have been grounded since the beginning of the war. In the case of certain of the more popular Government stocks—which generally means those due for redemption at a fairly short interval—it has become possible to realise reasonable amounts of stocks. The War Loan, however, which lacks the attraction of a final date for repayment, remains difficult to sell at the minimum price of 88½, at which the yield is about 4 per cent. Stocks of the Central Electricity and London Transport Boards are still quoted at the minima. This market as a whole can scarcely know how or where it stands until the Treasury announces the terms of its borrowing programme. It will apparently have to cover expenditure of over £1,000 millions in the current year.

Transport "C" Stock

It is clear that, after the decision to pay no final dividend on London Transport Board "C" stock, only the intervention of a fixed minimum price of 65 prevented the quotation from registering shock. Stockholders are receiving only 1½ per cent. —the rate of the interim dividend—for the year, against 4 per cent. previously. Receipts from fares, it seems, were up on the year but expenses were heavier, and the share of the pool with the main-line companies fell short of expectations. On the brighter side of the picture it is remembered that the present higher scale of passenger fares was in operation for only the last three weeks of the Board's year; and it is noted that up to September 1st, when control passed to the Government, the higher fares were doing all that was expected of them. Now that the right to apply for a receiver has gone from them, stockholders can but wait to hear the terms on which the Government has taken over. Home railway stockholders are in like case. The past week has seen the appearance of buyers of a number of the senior stocks at prices about the unofficial minima. Southern preferred has lost 2 points at 58. Thomas Tillings are $\frac{1}{6}$ down at 32s. 6d. British Electric Traction, after its heavy fall, has recovered 2¾, to 53⅜.

Tax Relief

The Chancellor's impositions have revived inquiry for investments which provide some relief from the full brunt of the excess profits tax and the higher rate of income tax. There is a sure market in the shares of a number of overseas companies which afford relief in these respects. Examples are the £1 ordinary shares of the Victoria Falls and Transvaal Power company, the undertaking which supplies electricity to most of the great gold mines of the Rand. The company is registered in Southern Rhodesia, and is therefore presumably outside the scope of E.P.T. In addition, dividends are paid with concessions in the way of Dominion income tax relief. From last year's payments, for instance, British income tax was deducted at the rate of only 3s. 3½d. in the pound. On the last dividends, totalling 15 per cent. for 1938, the yield on the shares at 63s. 9d. works out at £4 14s. per cent. The effective yield is appreciably higher when Dominion tax relief is taken into account.

East African Power

An interesting point about this company's ordinary shares is that dividends are paid free of British income-tax to all shareholders registered abroad. The shares are of 20s. (Kenya) each, equal to £1 sterling. Dividends are declared in Kenya currency, but shareholders on the London register may receive payment in the form of a sterling warrant. Shares can at present be bought at 20s. to yield 7 per cent. on the distributions which have been made, at that rate, for ten years past. The price compares with 26s. 3d. earlier this year. In supplying electricity to districts in Nairobi, Mombasa and, through a subsidiary, in Tanganyika, the company has seen steady growth in the number of units sold and in net revenues. New shares were issued in July at 21s., and rank for dividend this year. The company is domiciled in Kenya.

The Calcutta Electric Supply Corporation is maintaining the interim dividend at 4 per cent. tax-free. Shareholders have been advised not to expect more than 9 per cent. this year, against 10 per cent. for 1938. This, too, was before the rise in income-tax, which, of course, increases the expense of paying the same rate of tax-free dividend. The price of the shares is 2s. up to 27s. ex dividend.

Yields on Debentures

For an indication as to how well-secured debenture stocks have fared of late, it can be noted that North Metropolitan Power Station 3½ per cent. second mortgage debenture stock is on offer now at 85 (free of stamp duty), to yield £4 2s. 3d. per cent. flat, or £4 9s. 6d. per cent. allowing for redemption in 1965. The issue was made in June at a price of 91½. To make the comparison fair, it should be mentioned that early dealings were at a small discount. Wessex Electricity 3¾ per cent. debentures were offered at 96, also in June, and can now be bought at 92 (free of stamp). In this case the running yield is £4 1s. 6d. per cent., and the yield to redemption in 1959, £4 7s. 3d. per cent. County of London 3¼ per cent. debenture stock, at 80, gives much the same return on the money, while the irredeemable Kent Electric 4½ per cent. stock, at 107½, pays £4 3s. 9d. per cent. On "Three Counties" Electric 5 per cent. debentures at 104 the return is £4 16s. per cent., but only £4 11s. per cent. if the stock is repaid at 100 in 1952.

Case for Preference Shares

On many occasions reference has been made here to the changes that take place in what may be called financial fashion. Sometimes the fashion runs in favour of redeemable debenture stocks; at other times, ordinary shares claim the bulk of attention. Every now and then, it happens that the attractions of preference shares come into prominence, although in the normal course of events preference shares are regarded as uninteresting, and as holding little scope for the capital appreciation which investment loves to anticipate.

The raising of the income tax to 7s. 6d. in the £, added to the uncertainties that wait upon the operation of the E.P.T., now have the effect of directing public interest to preference shares in good class companies, on the ground that these can be relied upon to make, at any rate, sound and stable investments. Consequently the investor is paying more heed to preference shares at the present time than he has done for a considerable period. As an example of this, it may be observed that dealers in the Stock Exchange market for electricity supply shares publish lists of preference shares of which they want the offer. It may happen, of course, that in certain cases Stock Exchange dealers happen to be short of the particular shares for which they are asking. In other cases, however, the demand is on behalf of the investor who requires safety, and who is content to accept what are regarded, normally, as being humdrum and prosaic securities.

Improved Moulding Materials

MEANS of reducing the brittleness of polystyrene compositions with the object of rendering them more suitable for moulding electrical insulators are being developed at the Epsom research laboratories of the Distillers Co., Ltd., with Mr. H. M. Stanley as co-patentee. Plasticisers can be used for this purpose, but in the case of polystyrene the result is greatly to increase the power factor. The present patent (506,290 of 1937 completely accepted in 1939) therefore consists in the use of plasticisers of great purity in the sense of being composed solely of hydrocarbons, without even small traces of the halogens or hydroxy groups acquired during production by ordinary plasticisers.

A new Dutch process for producing water-resistant moulded products having potato starch (commercial starch) as the main constituent in addition to water and an aldehyde was described recently in the *Chemical Trade Journal* as the patent of Mr. R. A. van Linge, of Veendam, Holland. The process may be modified to produce a substance as clear as glass which is durable, of great hardness and only slightly sensitive to water; or a hard and elastic colourless substance that transmits light in a diffused condition.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Oct. 10	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	58/6	15	15	58/9	—	5 2 0
British Power and Light	30/9	21/–	7	7	11/–	–1/–	6 13 3
City of London	33/9	24/6	7½	7½	24/6	—	6 2 5
Clyde Valley	37/9	27/6	8	8	30/9	+9d.	5 4 1
County of London	46/9	28/–	10½	10½	30/–	+6d.	7 0 0
Edmundsor's :							
7% Pref.	31/6	27/6	7	7	27/6	–1/–	5 1 10
Ord.	27/9	18/6	9	6	19/6	+1/–	6 3 1
Elec. Dis. Yorkshire	41/6	32/6	9	9	32/6	—	5 10 8
Elec. Fin. and Securities	47/9	40/–	12½	12½	40/–	—	6 5 0
Elec. Supply Corporation	51/9	41/–	12	12	41/3	—	5 16 0
Isle of Thanet	20/–	15/–	4	4	15/–	—	5 6 8
Lancs Light and Power	34/6	25/–	7½	7½	25/–	—	6 0 0
Llanelly Elec.	22/6	17/6	5½	5½	17/6	–6d.	6 5 9
Lond. Assoc. Electric	30/–	18/9	7	7	18/9	—	7 9 4
London Electric	34/3	22/6	7	7	22/6	–⅛	6 4 5
London Power Deb. Red.	106½	98	5	5	99½	+1/–	5 0 6
Metropolitan	51/–	35/–	12	12	35/–	—	6 17 2
Midland Counties	38/9	30/–	8	8	30/9	+9d.	5 4 1
Mid. Elec. Power	41/9	35/–	8	9	35/–	—	5 2 10
Newcastle Elec.	28/9	26/–	7	7	26/3	—	5 6 8
North Eastern Electric :							
Ordinary	32/3	23/6	7	7	23/6	—	5 19 2
7% Pref.	32/6	27/6	7	7	27/6	—	5 1 10
Northampton	48/–	41/–	10	10	41/3	—	4 17 0
Notting Hill 6% Pref. (£10)	12½	11½	6	6	11½	—	5 4 4
Northmet Power :							
Ordinary	46/6	30/6	10	10	33/9	+⅛	5 19 0
6% Pref.	29/–	23/6	6	6	24/6	—	4 18 0
Richmond Elec.	29/–	23/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	28/6	8	8	29/6	+9d.	5 8 6
Southern Areas	22/9	17/–	5	5	17/–	–1/–	5 17 6
South London	30/9	23/9	7	7	23/9	—	5 18 0
West Devon	23/3	18/9	5	5	18/9	—	5 6 8
West Glos.	21/3	16/3	2	2½	16/3	—	3 1 6
Yorkshire Elec.	38/6	28/9	8	8	30/–	+⅛	5 6 8
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	1/6	—	—
Calcutta Elec.	39/–	25/–	10*	10*	27/–xd.	+ 2/–	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	—
East African Power	26/3	20/–	7	7	20/–	—	7 0 0
Jerusalem Elec.	24/6	21/–	7	7	21/–	—	6 13 4
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/–	—	7 0 0
Madras	31/–	21/3	8*	8*	21/3	—	—
Montreal Power	35½	30	1½	1½	31	—	—
Palestine Elec. "A"	29/6	20/–	7½*	5*	20/–	—	5 0 0
Perak Hydro-electric	18/9	13/6	7	6	16/3	—	7 7 8
Shawinigan Power	23½	20	85cts.	83cts.	22	—	—
Tokyo Elec. 6%	61	37	6	6	39½	—	15 4 0
Victoria Falls Power	73/9	60/–	12½	15	63/9	+½	4 14 0
Whitehall Investments Pref.	19/6	12/6	7½	7½	12/6	—	12 0 0
Public Boards							
Central Electricity :							
1950–70	112	103	5	5	103	—	4 17 1
1955–75	115½	104½	5	5	104½	—	4 15 8
1951–73	106½	101	4	1½	101	—	4 9 0
1963–93	95½	84	3½	3½	84	—	4 3 4
London Elec. Trans. Gtd.	88½	83	2½	2½	83	—	2 19 6
London & Home Counties							
1955–75	107½	105	4½	4½	105½	—	4 5 6
Lond. Passenger Transport :							
A	114½	103	4½	4½	103	—	4 7 5
B	117½	102	5	5	102	—	4 18 0
C	83½	64½	4	1½	65	—	2 6 2
West Midland Joint Elec.,							
1948–68	112½	104½	5	5	104½	—	4 15 8
Telegraph and Telephone							
American Tel. & Tel.	198	159	9	9	195	—	4 12 4
Anglo-Am. Tel.:							
Pref.	101½	89½	6	6	90	—	6 13 4
Def.	23⅜	18½	1½	1½	18½	–1½	8 2 2
Anglo-Portuguese	24/–	17/6	8	8	17/6	—	9 2 10
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	80/6	+1½	6 17 6
Ord.	55	34	4	4	46½	+1	8 12 0
Income	100	87½	—	—	87½	—	4 11 5
Canadian Marconi $1	5/6	3/9	—	Nil	5/3	–3d.	—
Globe Tel. & Tel.:							
Ord.	31/3	23/6	7½*	7½*	25/–	—	6 0 0
Pref.	26/9	22/6	6	6	22/6	—	5 6 8
Great Northern Tel. (£10)	38	27½	20	20	28	—	7 7 10
Inter. Tel. & Tel.	10½	5½	Nil	Nil	6¾	+¾	—
Marconi-Marine	30/–	23/–	7½	10	25/–	—	8 0 0
Oriental Telephone Ord.	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8½	5½	8	6	7	–½	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	7/–	10	10	7/–	—	7 2 10
Western Union	40½	19½	2¾	—	40	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	3/9	—	—
4% Inc.	16	5	Nil	Nil	5½	—	—
British Electric Traction :							
Def. Ord.	1025	515	5	5	538	+23	—
Pref. Ord.	164	130	8	8	130	—	5 6 3
Bristol Trams	52/6	36/3	8	10	36/3	—	5 10 4
Brazil Traction	13	7½	$1	50c.	7½	—	—
Calcutta Trams	25/6	20/9	8	8	20/9	—	7 14 3
Cape Elec. Trams	18/–	16/9	5	6	17/–	—	7 1 2
Lancs Transport	37/9	27/6	10	10	27/6	–¼	7 5 5
Mexican Light :							
1st Bonds	25	20	5	5	20	—	—
Rio 5% Bonds	81	47	5	5	60	—	8 6 8
Southern Rly :							
5% Prefd.	75½	48	5	5	58	–2	8 12 4
5% Pref.	99½	79	5	5	80	—	6 5 0
T. Tilling	2½	32/6	10	10	32/6	—	6 3 1
Tilling & B.A	54/6	43/9	10	9*	43/9	—	4 2 3
West Riding	37/9	30/–	10	10	30/–	–½	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	30/–	—	10 0 0
Assoc. Elec. :							
Ord.	45/3	31/3	10	10	32/6	–⅛	6 3 1
Pref.	36/6	31/3	8	8	31/3	—	5 2 5
Automatic Telephone & El.	47/6	39/3	10	12½	40/–	—	6 5 0
Babcock & Wilcox	48/–	37/–	10	12½	42/6	—	5 17 8
British Aluminium Ord.	58/9	48/9	12½	12½	52/–	+9d.	4 17 6
British Insulated Ord.	88/–	72/6	20	20	72/6	—	5 10 3
British Thermostat (5/–)	16/–	12/–	18½	18½	13/3xd.	+3d.	6 14 7
British Vacuum Cleaner (5/–)	22/6	12/6	40	40	12/6	—	—
Brush Ord.	5/9	4/–	Nil	Nil	4/–	–9d.	—
Callender's	92/–	52/6	20	15	52/6xd.	+9d.	5 11 3
Chloride Elec. Storage	82/3	62/6	20	15	3½	—	4 12 4
Consolidated Signal	96/–	75/–	36½	36½	75/–	—	9 14 8
Crabtree (10/–)	25/6	17/6	17½	17½	17/6	—	10 0 0
Crompton Parkinson :							
Ord. (5/–)	21/–	12/6	12½	15	15/–	—	—
E. K. Cole (5/–)	9/–	3/–	10	Nil	3/–	—	—
Elec. & Musical Industries (10/–)	14/9	7/–	5	Nil.	7/–	–6d.	7 2 10
Electric Construction	38/6	30/6	12½	13½	35/–	—	7 14 2
Enfield Cable Ord.	58/6	42/6	25	16½	42/6	–½	7 13 0
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/6	25/–	10	10	28/9	+½	6 19 2
Ensign Lamps (5/–)	16/9	13/9	—	25	15/9	—	7 18 3
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	35/0xd.	–6d.	3 11 5
Ever Ready (5/–)	24/–	18/–	35	30	23/–	+1/–	6 10 4
Falk Stadelmann	27/–	17/6	10	6	17/6	—	6 17 2
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6 1 9
G.E.C. :							
Pref.	31/9	26/3	6½	6½	26/3	—	4 19 2
Ord.	82/–	61/3	17½	20	65/–	+⅛	6 13 1
Greenwood & Batley	27/6	22/6	7	15	22/6	—	13 6 8
Hall Telephone (10/–)	22/3	19/3	15	15	20/–	—	7 10 0
Henley's (5/–)	21/–	15/–	20	20	15/–	–⅛	6 13 4
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4 4 8
Hopkinsons	46/3	37/3	12½	15	37/6xd.	–1/–	8 0 0
India-Rubber Pref.	21/3	18/9	5½	5½	18/9	—	5 17 4
Intl. Combustion	120/–	97/–	32½	32½	5	–½	6 10 0
J. Lucas	60/–	45/–	15	15	45/–	–⅛	6 13 4
Johnson & Phillips	41/3	32/–	12½	12½	35/–	–⅛	7 2 10
Lancashire Dynamo	72/–	55/–	25	25	55/–	–½	9 1 10
Laurence Scott (5/–)	12/–	9/6	15	15	9/6	—	7 18 4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	39/–	13½	13½	39/6	–1/9	6 16 8
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	--	5 3 6
Murex	85/9	63/9	20	20	76/3	+⅛	5 5 0
Pye Deferred (5/–)	13/9	7/6	25	25	7/6	—	16 13 4
Revo (10/–)	35/6	25/–	17½	17½	25/–	—	7 0 0
Reyrolle	61/–	52/6	12½	12½	52/6	–½	4 15 3
Siemens Ord.	26/9	18/9	7½	7½	18/9	–⅛	8 0 0
Strand Elec. (5/–)	5/6	3/3	10	4	3,3	—	6 3 1
S. Smith (1/–)	9/–	6/–	37½	50	6/3	—	8 0 0
Switchgear & Cowans (5/–)	15/–	10/–	20	20	10/–	—	10 0 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	37/3	10	10	38/9	—	5 3 1
Telephone Mfg. (5/–)	10/–	7/–	9	9	7/–	–3d.	6 8 7
Tube Investments	91/–	72/6	23½	23½	77/6	+⅜	6 4 3
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	14/6	10	10	15/9	+1/–	6 7 0
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	36/6	17½	17½	36/3	–⅛	9 13 2
Walsall Conduits (4/–)	31/9	21/3	55	55	21/3	–1/–	10 7 0
West, Allen (5/–)	7/6	5/9	7½	10	5/9	—	8 14 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.*1.

Australia.—BRISBANE.—City Council. October 27th. One three-phase, 17,500-kVA transformer. (T. 26873/39.)*

October 24th. City Electric Light Co., Ltd. Paper insulated, lead-covered cables. (T. 26907/39.)*

November 8th. Four 500-kVA transformers. (T. 27252/39.)*

PERTH.—November 2nd. Western Australia Government Tender Board. Supply and delivery of two 500-kW mercury arc rectifiers, switchgear, feeders, control system, &c. (T. 26439/39.)*

SYDNEY.—October 17th. Posts and Telegraphs Department. Lead sheathed cable. (T. 26613/39.)*

October 24th. Lamps, lamp caps and sockets. (T. 26617/39.)*

Loading carrier coils, &c. (T. 26806/39.)*

MELBOURNE.—October 31st. Posts and Telegraphs Department. Transmitters and parts. (T. 27227/39.)*

INGHAM (QUEENSLAND). — November 6th. Hinchinbrook Shire Council. Crude-oil engine and alternator. (T. 27418/39.)*

Brighton.—Corporation. October 16th. Civil engineering works in connection with the augmentation of the circulating water system at Southwick power station. Specifications from W. N. C. Clinch, borough electrical engineer and manager.

Cardiff.—October 18th. King Edward VII Welsh National Memorial Association. X-ray equipment for (a) the South Wales Sanatorium, Talgarth, Brecknockshire, and (b) the Brynseiont Hospital, Caernarvon. F. J. Alban, Memorial Offices, Cathays Park.

Egypt.—CAIRO.—October 18th. Extension of the electrical network at Damietta. Municipalities Department. (T. 26152/39.)*

India. — NEW DELHI.—October 26th. Cotton and silk covered and enamelled copper wires required for the year ending February 28th, 1941. (T. 26947/39.)*

Ipswich.—November 21st. Corporation. Steel-frame buildings for boiler and turbine house, and a 110-ton and other electric overhead travelling cranes at the new Cliff Quay power station. (October 6th.)

Leicester.—October 14th. 30-kW auxiliary lighting plant at City Fire Brigade headquarters. Specifications from Chief Officer, Fire Brigade, Lancaster Place.

London. — BATTERSEA. — October 31st. Electricity Department. One 30,000-kW turbo-alternator and ancillary plant, and two 180,000 lb. boilers and ancillary plant. (September 29th.)

Manchester.—October 19th. Electricity Committee. 3-phase, 4-wire 400/240-V AC sub-station switchgear for twelve months ending December 31st, 1940. (October 6th.)

October 19th. Electricity Committee. Supply for twelve months ending December 31st, 1940, of AC electric fan motors. (September 29th.)

New Zealand.—WELLINGTON.—November 14th. Supply of 50-kV, three-phase, outdoor switchgear and steelwork complete with insulators and accessories. (T. 26179/39.)*

November 21st. Public Works Department. Protective relays for 110-kVA transmission lines. (T. 26821/39.)*

December 5th. 50-kV outdoor switchgear and steelwork for Hangatiki sub-station and 110-kV outdoor switchgear and steelwork for Ongarue sub-station. (T. 27495/39.) Four 10,000-kVA transformer units. (T. 27496/39.)*

November 28th. Two 1,500-kVA transformer banks. (T. 27493/39.)*

November 14th. Twenty-four 110-kV single-phase potential transformers. (T. 27492/39.)*

November 24th. Post and Telegraph Department. Engine-generator set. (T. 27490/39.)*

Plymouth.—November 15th. Electricity Supply Department. Ash disposal plant and auxiliary apparatus. (See this issue.)

Sheffield.—November 7th. Electricity Committee. Auxiliary 11-kV three-phase, 150-MVA switchgear. (October 6th.)

South Africa.—JOHANNESBURG. — November 17th. City Council. 33-kV switchgear and auxiliary plant. (T. 25663/39.)*

November 20th. Railways and Harbours Administration. Superheater elements. (T. 26975/39.)*

CAPE TOWN.—November 15th. Electricity Department. Two mercury arc rectifier equipments. (T. 27601/39.)*

November 1st. Electricity Supply Commission. Suspension insulator strings and strain yokes. (T. 27603/39.)*

WINDHOEK.—October 18th. Municipality. Two AC generators. (T. 26700/39.)*

Uruguay. — MONTEVIDEO. — November 10th. State Electricity Supply and Telephones Administration. 300,000 metres of telephone cable. (T. 26933/39.)*

Orders Placed

Barrow-in-Furness. — Electricity Committee. Accepted. High-voltage switchgear (£1,029).—British Thomson-Houston Co. Kiosk (£625).—Metropolitan-Vickers Elecl. Co. Low-voltage board (£125).—Lucy & Co. Extra-high-voltage switchgear (£341).—Electric Construction Co. 200-kVA transformer (£160). — British Electric Transformer Co.

Cleansing Committee. Accepted. Electric lethal cabinets for the destruction of cats and dogs (£60).—General Electrical Construction & Maintenance, Ltd.

Blackpool.—Electricity Committee. Accepted. Three new wheels for turbine. —General Electric Co.

Education Committee. Accepted. Electrical installation at Norbreck junior school.—Ramsden Bros.

Housing Committee. Accepted. Electrical installations: St. Walburgas Road. —A. S. Partington. St. Anne's Road.—G. D. Lax.

Chesterfield. — Electricity Committee. Accepted. Turbine blades (7,830 Swiss fr.).—Escher Wyss Engineering Works.

Education Committee. Accepted. Electrical installation at school (£58).—A. E. Parsons.

Colchester. — Essex County Council. Recommended. Refrigeration plant at Broomfield Hospital (£574).—Essex Electrical Installations, Ltd.

Gt. Yarmouth.—Electricity Committee. Accepted. Switchgear (£263).—English Electric Co.

Leeds.—Libraries Committee. Accepted. Electrical fittings and lamps for Cross Gates library (£288).—R. O. Jones.

Health Committee. Accepted. Electrical work at isolation hospital (£304).—Allenby & Stockell.

Electricity Committee. Accepted. Rearrangement of coal-handling plant at Kirkstall power station (£5,949 plus £500 for demolition of telpher plant).—International Combustion, Ltd. 33-kV switchgear for Beeston Royds sub-station (£22,953).—Metropolitan-Vickers Electrical Co., Ltd. 33-kW turbo-alternator with Worthington Simpson condensing plant (£137,312). — British Thomson-Houston Co.

Lighting Committee. Accepted. Traffic signals in Wellington Street (£495).—Automatic Telephone & Electric Co.

Watch Committee. Accepted. Installation of Diesel engine generating unit for secondary lighting at the town hall (£416).—New Pelapone Engine Co.

Newcastle-on-Tyne.—City Council. Accepted. Installation of new positive plates and separators at the Manors main sub-station (£1,627).—Edison Swan Electric Co.

Romford.—Essex County Council. Accepted. X-ray plant for Oldchurch Hospital (£1,302).—Newton & Wright, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyme.—Council school. Mosley Road, for the E.C.; J. Eaton and Sons, architects, Stamford Street.

Axminster.—Extensions, Cottage Hospital; J. N. Webster, president.

Barking.—Factory; Manor Joinery Works, Ltd., Alfred's Way. Shops and flats, Edgefield Avenue; Leftley Bros., Ltd., Longbridge Road, Barking.

Barrow-in-Furness.—Houses (16), Hollow Lane; Hornby Building Co.

Berwick.—Houses (10), Spittal, for the T.C.; J. H. Pierce, builder, Dunbar. Houses, East Sunnyside Farm; borough engineer.

Birmingham. — Gymnasium and chapel, 102, Mosley Road, for the Catholic authorities of St. Ann, Alcester Street; Parsons & Morrin, Ltd., contractors, 133, Belgrave Road, Birmingham.

Blackpool.—Hotel, corner of the Promenade and Bank Street; Halstead Best, architect, Leeds Buildings, 20, Clifton Street, Blackpool. Shops and flats, Talbot Road; J. Gregson & Son. Hotel, Banks Street; Clarke & Rutherford. Houses (35), Lawson Road; Ramsden Bros., Ltd. Additions to County Hotel, Promenade; County Hotel, Ltd.

Bridgwater. — Factory, Washington Gardens, for S. Leffman, London, E.C.1; H. W. Pollard & Sons, contractors, Monmouth Street.

Bromsgrove.—Cinema, High Street, for Raglan Theatre, Ltd.; H. W. Weedon, architect, 84, Colmore Row, Birmingham.

Caernarvonshire.—Gymnasium, Llandudno County School, and alterations and additions, Brynrefail County School; Westbury Lloyd Jones, county architect, County Offices.

Caistor (LINCS).—Extensions to the Osgodby Isolation Hospital; J. P. Mason, surveyor, Council Offices, Caistor.

Chatham.—Rebuilding licensed premises at The Brook, for Style & Winch, Ltd.

Chelmsford.—Fire station and cottages for R.D.C.; surveyor.

Chesterfield.—Houses (12), Clarkson Avenue; A. Clarke.

Chester-le-Street. — Pithead baths, Ouston E. Pit; Wright and Kellett, Ltd., builders, Chester-le-Street.

Chorley.—Senior school, for Rev. R. Bilsborrow, Church of St. Gregory, Weld Bank; F. X. Velarde, architect, 3, Abercromby Square, Liverpool.

Colwyn Bay. — Rebuilding Liverpool House; Ashworth Bros., contractors, Westminster Chambers, Nantwich.

Cowes (I.O.W.).—Cinema, Bingham Road, for I.W. Theatres, Ltd.

Croydon. — Extensions to factory; Stuart Turner & Co., Sentinel Works, Fairview Road.

Doncaster.—Church, Intake, for Canon A. Ll. Davies; Walter Firth, Ltd., contractors, Lockwood Road, Doncaster.

Durham.—Additions to Chopwell East School and remodelling of Chopwell West School, for the County E.C.; county architect, 34, Old Elvet, Durham.

Eastbourne. -- Alterations to York House Hotel, Royal Parade; A. M. Williamson. Gymnasium, West Hill School, Mill Road; Miss P. Reeves.

Eire. — Schools, Larkhill, Dublin; Robinson and Keefe, architects, 8, Merrion Square N., Dublin.

Gainsborough.—Administrative block,

Foxby Hill Isolation Hospital; U.D.C. surveyor.

Glasgow.—Extensions to works, Croft Bodybuilding & Engineering Co.; Jas. Monro & Sons, architects, 307, West George Street, Blythswood.

Guildford.—Factory for British Surgical Industries, 4, Bryanston Street, London, W.1; E. G. Cole, architect, 79, Grosvenor Street, London, W.1.

Hastings.—Estate development, Bexhill Road; Hubbard Ford, architect.

Ilford.—R.C. senior school (£20,000); Thomas H. B. Scott, architect, 110, Horseferry Road, Westminster, S.W.1.

Jarrow (Co. DURHAM).—Alterations to Bede Burn School for the E.C.; D. Glen, builder, Back Queen's Road, Jarrow.

Keighley. — Houses (29), Fellwood Avenue, for H. Burrell, Goulbourne Street.

Kilmarnock. — Court-house (£12,000); county architect, Ayr.

Lancashire.—School clinic at Waterloo, Limehurst, near Ashton-under-Lyne (£6,000); S. Wilkinson, county architect, County Offices, Preston.

Leeds.—Shops, King Lane and Garth Walk; Henry Lax, Ltd. Shops, Dixon Lane, Wortley; A. Maude & Sons.

Liverpool.—Houses (22), Island Road South and Woolton Road, for Daleholm Estates; S. E. Tucker, architect, 15, St. Philip's Avenue, Liverpool. Extensions to works, Tysons, Ltd., Dryden Street; H. C. Killender, architect, 62, Dale Street, Liverpool.

London.—Warehouses, 42-48, Paddington Street, and 62-72, Chiltern Street, W.1, for Marks & Spencer, Ltd.; H. Boyer, Ltd., contractors, Harrow Road, Wembley. (CAMBERWELL).—Extensions to factory, Wightman & Co., Dugdale Street; Alistair G. Macdonald, architect, 14, John Street, Strand. (WANDSWORTH).—Extensions to works, E. J. Page & Co., Kimber Road, Southfields, S.W.18; H. R. Ross, architect, 65, Chancery Lane, W.C.

Maidenhead.—Extensions to factory, for Nicholson & Sons, Ltd.

Malton (YORKS).—Isolation hospital, for U.D. Council; T. W. Preston, U.D.C. Offices, Malton.

Manchester.—Senior school at Eccles Old Road, Pendleton; J. C. Prestwich & Sons, architects, Bradshawgate, Leigh.

Margaretting.—Mental hospital, for Essex C.C.; Walter Strong, Ltd., builders, 220, Bishopsgate, London, E.C.2.

Morecambe. — Extensions to works at Westgate; Thos. Dryden & Son, architects, Grimshaw Street, Preston.

Newark.—Extensions to technical college (£3,500).

Newcastle-under-Lyme. — Houses at Bramwell Hall Farm estate; borough surveyor. Conversion of buildings into senior school; A. V. Shenton, Ltd., contractors, Hulme Road, Normorcot, Stoke-on-Trent.

Northallerton (YORKS).—Isolation hospital; J. Hunt, U.D.C. Offices.

North Shields.—Workshops, Smiths Dock Co., Ltd.; T. Hanning & Partners, 2, Collingwood Street, Newcastle-on-Tyne.

Orpington.—Houses, Downe, and Green Street Green, for U.D.C.; Allen & Potter, architects, Maxwell House, Arundel Street, W.C.2.

Plymouth. — Houses (14), Seacroft Road; W. Andrews. Houses, Margaret Park; Hartley Vale Estates, Ltd.

Rawtenstall.—Extensions, Rossendale works; Lambeth, Howorth & Sons, Ltd. Filter house, Goodshaw Chapel; Irwell Valley Water Board.

Rochdale.—Extensions to "A" block, Birch Hill Hospital, for T.C.; T. Wilkinson, Ltd., contractors, Walpole Street Mills, Rochdale.

Rotherham.—Extensions to Municipal General Hospital; Vincent Turner, borough engineer. Works additions, Mangam Road; S. Yorks Chemical Works, Ltd. Foundry, Don Street; Guest & Chrimes, Ltd.

Scarborough.—Schoolroom, St. Thomas' Church; Wilkinson and Smith, architects, Queen Street, Scarborough.

Sheffield.—Workshop, Tinsley Park Road, for James Wilkinson & Son, Ltd., Attercliffe. Bakery and warehouse, shops and house, Herries Road; M. J. Gleeson, Ltd., 822, Chesterfield Road. Commercial garage, Bailey Lane, for Central Motors (Sheffield), Ltd., 105, West Street. Cinema, Stannington Street; Chapman & Jenkinson.

Skelmersdale.—Potato flour factory for Farmers' Produce Co., Wisbech.

Slough.—Extensions to Town Hall (£11,000), for T.C.; H. Tyson Chambers, Ltd., contractors, Trading Estate, Slough.

Southall.—Houses, Windmill Lane; Osterley Tudor Estates, Ltd.

South Shields.—Infectious diseases hospital at Harton, for the T.C.; borough engineer.

Staffordshire.—Highways depôt offices, Stafford Road, Uttoxeter, for C.C.; county architect, County Buildings, Stafford. Extensions to Stone Senior Council School, comprising cookery, handicraft and metalwork departments; county architect.

Staines.—Factory; W. E. Sykes, Ltd., Manor Place.

Stamford.—Nurses' home at the Stamford Infirmary (£8,270); F. J. Lenton, architect, of Taylor & Lenton, 16, Broad Street, Stamford.

Stirlingshire.—Reconstruction of headquarters of constabulary (£11,477); architect, County Offices, Stirling.

Stockport.—Extensions to nurses' home and erection of mortuary block at Stepping Hill Hospital; H. S. Fairhurst & Sons, architects, 55, Brown Street, Manchester.

Sunderland. — Fire station, report centres and storage building; borough engineer. Conversion of buildings in St. George's Square into juvenile employment bureau; J. M. Black, junr., contractor, Back Glen Street, Hebburn-on-Tyne.

Surrey.—Occupational therapy buildings, Brookwood Mental Hospital, for C.C.; G. H. Billimore & Sons, builders, Guildford.

Torquay.—Additions to Lincombe Hall, Meadfoot Road; Lincombe Hall, Ltd.

Uxbridge.—Factory, Harefield, for Garden, Heating and Fireplace Co.

Wakefield.—Houses (44), Flanshaw estate; Geo. Crook & Sons, Ltd. Alterations to British Oak Inn, Kirkgate; Beverley Bros., Ltd. Warehouse, Henry Street; J. C. Waterhouse. Shops and houses, Batley Road; C. H. Crowther. Works extensions, Horbury Road; R. Sutcliffe & Co., Ltd.

Wallsend.—Flats, North Road and Station Road; N. Willis, builder, Shields Road, Walkergate, Newcastle-on-Tyne. Flats, near High Street, for Scott and Middleton; J. Carr, builder, Central Avenue, South Shields.

Warlingham.—Houses (29), Tithe Pit Lane; R. J. Clarke & Co.

Warrington.—Extensions to works for Peter Stubs, Ltd., Scotland Road.

Wenlock.—Fire station; borough surveyor.

West Bromwich.—Factory, Industrial Fan & Heater Co., Ann Road, Smethwick.

West Hartlepool.—Police station, Hart Road, for Durham C.C.; county surveyor. 20, Old Elvet, Durham.

Westerham.—Cinema; A. P. Starkey, architect, Harrow.

Windsor.—Additions, Windsor Hospital; borough surveyor.

Woking.—Headquarters, Bath Road and Commercial Road, for Woking Y.M.C.A.; Kenneth Wood and C. H. Rose, architects, 20, The Broadway.

Worcestershire.—Public Assistance Institution, Kidderminster, for C.C.; county architect, Worcester.

New Patents

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

1. "Electrical systems of remote control." General Electric Co., Ltd., and N. C. Smart. January 1st, 1938. (512417.)

3379. "Electrical calculating and indicating apparatus." English Electric Co., Ltd., and H. H. Begent. February 3rd, 1938. (512464.)

6356. "Telecinematographic and like apparatus." Baird Television, Ltd. (Fernseh Akt.-Ges.) March 1st, 1938. (512421.)

6368. "Combined electric motor and speed-reducer units." A. Delaplace. March 3rd, 1937. (512469.)

6430. "Colour-lighting apparatus." Holophane, Ltd., and R. G. Williams. March 1st, 1938. (512425.)

6518. "Cables and hosepipes." Liverpool Electric Cable Co., Ltd., and J. T. Frost. March 2nd, 1938. (512475.)

6617. "Spinner devices for electric fires and the like." H. H. Berry and C. A. Painton. March 2nd, 1938. (512481.)

6713. "Plating nickel on electro-positive metals, especially zinc and zinc alloys." N. Rupp. March 3rd, 1938. (512484.)

6722. "Traffic-control systems." Automatic Telephone & Electric Co., Ltd., and G. W. Thompson. March 3rd, 1938. (512439.)

6728. "Electrically driven shaving apparatus." Siemens & Halske Akt.-Ges. March 18th, 1937. (512440.)

6812. "Electrical measuring instruments." R. Mercer (Weston Electrical Instrument Corporation.) March 4th, 1938. (512444.)

6896. "Automatic interrupters or current reversers for electro-medical purposes." Marconi's Wireless Telegraph Co., Ltd., and A. W. Lay. March 4th, 1938. (512451.)

7084. "Methods of obtaining image signals in television and like systems." Fernseh Akt.-Ges. March 6th, 1937. (512489.)

7203. "Electric discharge tubes." Neon-electric Co., Ltd., and S. W. Wilkins. March 8th, 1938. (512492.)

7509. "Trolley wire fittings for supporting overhead electric cables." A. Wiseman and W. Simmons. March 10th, 1938. (512493.)

7734. "Means for winding flexible materials on to spools, bobbins, or the like." British Insulated Cables, Ltd., J. C. Bannister and W. J. Clements. March 12th, 1938. (Cognate application 14074/38.) (512495.)

8278. "Directional lighting fittings." General Electric Co., Ltd., and J. B. S. Smyth. March 17th, 1938. (512500.)

8700. "Washing machines." British Thomson-Houston Co., Ltd., F. H. Clough and G. A. Williams. March 21st, 1938. (512503.)

8701. "Washing machines." British Thomson-Houston Co., Ltd., and F. H. Clough. March 21st, 1938. (512504.)

11202. "Combinations of high-pressure metal-vapour electric discharge lamps with electric incandescent lamps in series with them." General Electric Co., Ltd., and J. Cates. April 12th, 1938. (512506.)

11641. "Time-switch for traffic-direction indicators." H. Morat. May 19th, 1937. (512507.)

12008. "Method of and means for projecting televised images." P. M. G. Toulon. June 9th, 1937. (Cognate application 12009/38.) (512508.)

33269. "Electrical systems of remote control." General Electric Co., Ltd., N. C. Smart, and H. Stead. January 1st, 1938. (Divided out of 512417.) (512457.)